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United States Agency for International Development (USAID)

Contract No: USAID KSC-229

REVISED GEOTECHNICAL REPORT FOR Salang Tunnel Substation, Parwan Province, Afghanistan

Prepared By

Shawal Geotechnical Engineering/Materials Testing Laboratory

Submitted By

TETRA TECH

Date: December 11, 2013

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Investigated By:

Shawal Geotechnical Engineering/Materials Testing Laboratory

GEOTECHNICAL REPORT

FOR

Salang Tunnel Substation, Parwan Province, Afghanistan

December 11, 2013

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1- Description about this project

United States Agency for International Development (USAID) *is Client.*

TETRA TECH *is Contractor and also has undertaken a project that consists of design and construction of Salang Tunnel Substation, Parwan Province, Afghanistan.*

M/s Shawal Geotechnical Engineering/Materials Testing Laboratory (GEMTL) received authorization from TETRA TECH to carry out subsoil investigations at the proposed site for the design of foundations and other geotechnical aspects of the proposed construction and also the Shawal (GEMTL) has function of Geotechnical Investigation and providing comprehensive Geotechnical Report of this Project.

This report presents the results of Geotechnical Site Assessment prepared by Shawal GEMTL for the proposed construction of Salang Tunnel Substation, Parwan Province, Afghanistan.

Disturbed and Undisturbed Soil samples from each Test Pits and Boreholes have taken from different depths in changing materials and transported to Shawal GEMTL Material testing Laboratory for desired lab tests.

This Geotechnical Report consist of complete field investigations, subsurface soil description of project area, In-situ test results, Lab test results, engineering evaluation and geotechnical recommendation for foundations, with Bearing capacity evaluation and other engineering evaluations and recommendations.

2- Purpose of Geotechnical Investigation in this Project

For Design and construction of the foundations the Site specific geotechnical information has been necessary to other geotechnical related items contained and determine all necessary geotechnical conditions by appropriate field and laboratory investigations and also supporting the calculations in this project.

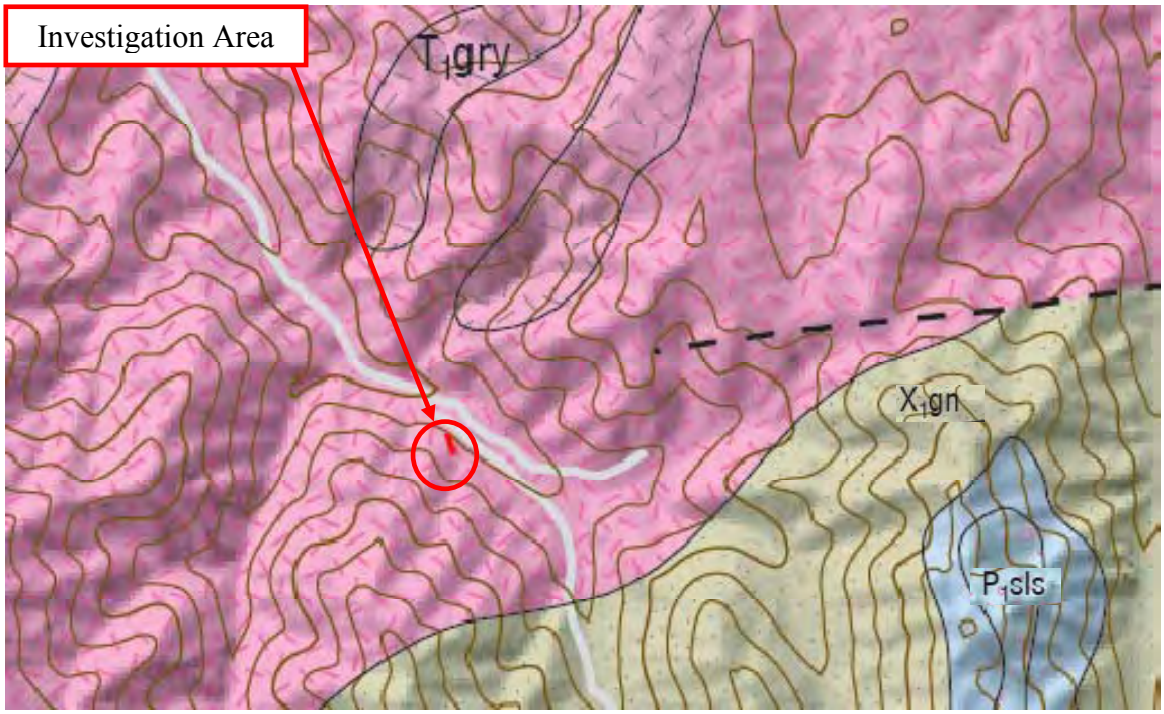
The scope of work included the following:

- *Review of available data pertinent to the site.*
- *Describing the field and laboratory phases of the investigation, together with site conditions, the foundation related subsurface conditions.*
- *Soil samples taken from Test Pits in polyethylene plastic wrapping to protect against moisture loss and Handling to Central Shawal GEMTL Company Material Testing Laboratory.*
- *Soil samples taken from Boreholes in Core Boxes and Handling to Central Shawal GEMTL Company Material Testing Laboratory.*

- *Determination of the physical and mechanical properties of the soil samples representing different soil layers, as well as developing essential criteria and parameters for foundation design purposes.*
- *Perform required and designed Geotechnical In situ tests consist of boring of Boreholes and Excavation of Test Pit with SPT test, field density test and Percolation Test.*
- *Perform all required and designed Lab tests on soil samples according to ASTM standards.*

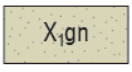
3- The Investigation Area General Geological Conditions

Site project Area is located on ***T_1gry*** *Granite and granosyenite (Early Triassic)—Granite, granosyenite (Phase IV).*



Location of project area Construction of Salang Tunnel Substation, Parwan Province, Afghanistan) in geological map has shown by Figure No.1.

Granite and granosyenite (Early Triassic)—Granite, granosyenite (Phase IV)



Gneiss (early Paleoproterozoic)—Two-mica, biotite, biotite-amphibole, garnet-biotite, garnet-sillimanite-biotite, pyroxene-amphibole, plagioclase, and cordierite gneiss; schist, migmatite, quartzite, marble, amphibolite

Siltstone and sandstone (Early Permian)—Siltstone and sandstone more abundant than slate, limestone, conglomerate, grit

4- *The Investigation Area Geographical Location*

The general site location is in Parwan Province, Location of project has shown by Figure No.2in Afghanistan map and Project Site area.

Figure No.2: Location of Parwan Province in Afghanistan Map(AIMS)

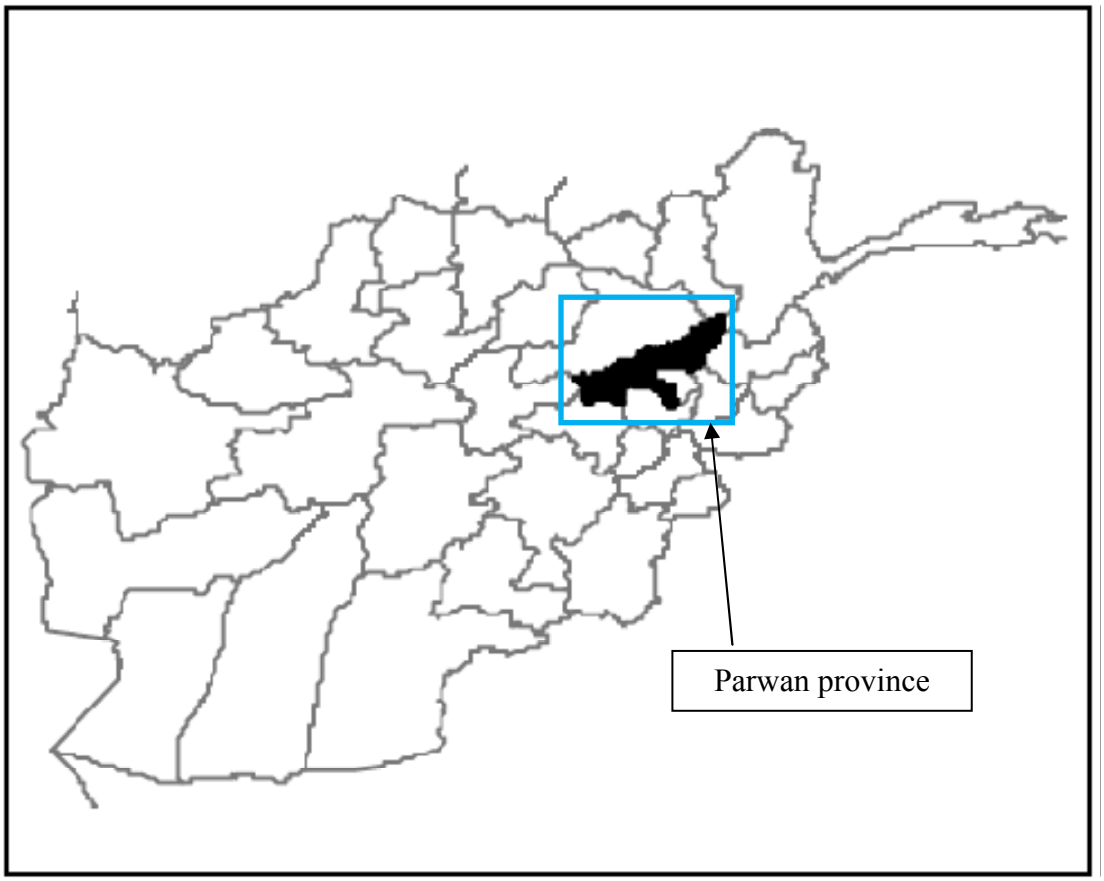


Figure 2. Location of project area in Parwan Province, Afghanistan Map (AIMS)

4.1. Tectonic setting of investigation area

Afghanistan is located in a tectonically active region at the western extent of the Indo-Asian collision zone, where ongoing deformation has generated rugged mountainous terrain, and where large earthquakes occur frequently. These earthquakes can cause damage, not only from strong ground shaking and surface rupture, but also from liquefaction and extensive land sliding. The magnitude 6.1 earthquake of March 25, 2002 highlighted the vulnerability of Afghan communities to such hazards, and resulted in at least 1000 fatalities.

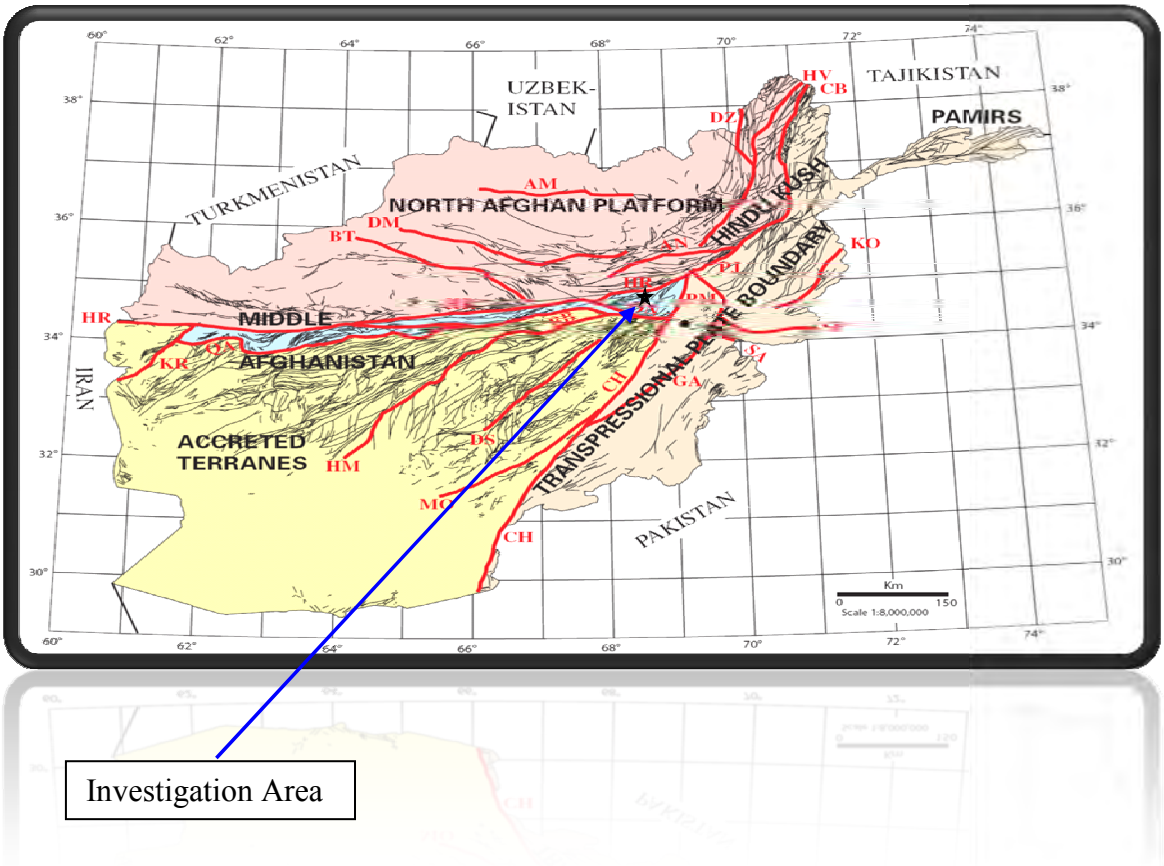


Figure No:3. Tectonic regions of Afghanistan. Pink, North Afghan platform; blue, Middle Afghanistan; yellow, terranes that were accreted to the platform (Project area).; tan, left-lateral transpressional plate boundary between the Indian and Eurasian platesBlack dot south of "PM" shows location of Kabul. Black and red fault traces from figure. Hindu Kush and Pamirs are high mountain ranges.Locations of faults that are named in the text (red). Fault traces from USGS-funded digitization of the geologic map of Shareq and Chmyriov (1977) (black). Abbreviations of fault names: AM, Alburz Marmul; AN, Andarab; BB, Bande Bayan; BT, Bande Turkestan; CH, Chaman; CB, Central Badakhsan; DZ, Darvaz; DM, Dosi Mirzavalan; GA, Gardez; HR, Hari Rod; HM, Helmand; HV, Henjvan; KR, Kaj Rod; KO, Konar; MO, Mokur; ON, Onay; PM, Paghman; PJ, Panjshir; QA, Qarghanaw; SA, Sarobi; SP, Spinghar (USGS, 2007).

4.2. Fault Characterization

Previous geological studies in Afghanistan have broadly defined the locations of major Neogene (< 25 m.y.) faults and fault zones. In this study, we more accurately locate and map individual strands of fault systems that have Quaternary move ment, and have identified previously unreported possible Qua ternary faults. Because this was done systematically through out Afghanistan, we recognized patterns of faulting that offer new insight into regional tectonics, and place limits on viable models of modern deformation. Because our interpretations of lineaments, dip-slip faults, and other features in a regional kinematic framework are strictly preliminary, the combination of our mapping and the resultant digital database provide a basic foundation and starting point for compiling geological data that can be utilized for preliminary seismic-hazard analy sis, and can be updated as new information is collected. For this map, we characterized features based on their continuity and expression in young (Quaternary) geologic deposits and on the approximate amount of vertical and(or) horizontal displacement (estimated in meters) of a specific landform. Previous mapping of the Quaternary geology of Afghanistan (Abdullah and Chmyriov, 1977; Doebrich and Wahl, 2006) provides general information about the relative ages of some deposits and landforms (fig. 4), but their absolute ages are largely unknown. In the absence of absolute age information for specific deposits, it is impossible to determine fault slip rates. However, we can broadly estimate slip rates by estimating the age of a deposit, that is, Holocene versus latest Pleistocene or late Pleistocene on the basis of its general geomorphic expression in the landscape. Even this type of generalized slip-rate estimate is a helpful indicator of the level of hazard associated with a feature. Ultimately, we need to conduct ground-based studies at selected locations to obtain critical data on the age of deposits and the amount of offset in order to determine more accurate, geologically based slip rates.

Earthquakes that rupture the ground surface displace geomorphic surfaces and geologic deposits vertically, horizontally, or obliquely (a combination of vertical and horizontal offset). The Landsat imagery only gives us a vertical, two-dimensional view of the landscape, and as a result, is best suited to detect horizontally offset features, such as those along the left-lateral strike-slip Chaman fault (Figure No:4)Because of the imagery's vertical perspective, it is far more difficult to identify faults that have mainly vertical movement, and thus more difficult to measure the amount of vertical displacement.

Because of the constraints imposed by the imagery's resolution and the interpretive nature of our work, we developed a three-category scheme to qualitatively characterize the expression of

our mapped features in the landscape. The scheme also reflects our confidence in the role that they play in the contemporary tectonics of Afghanistan.

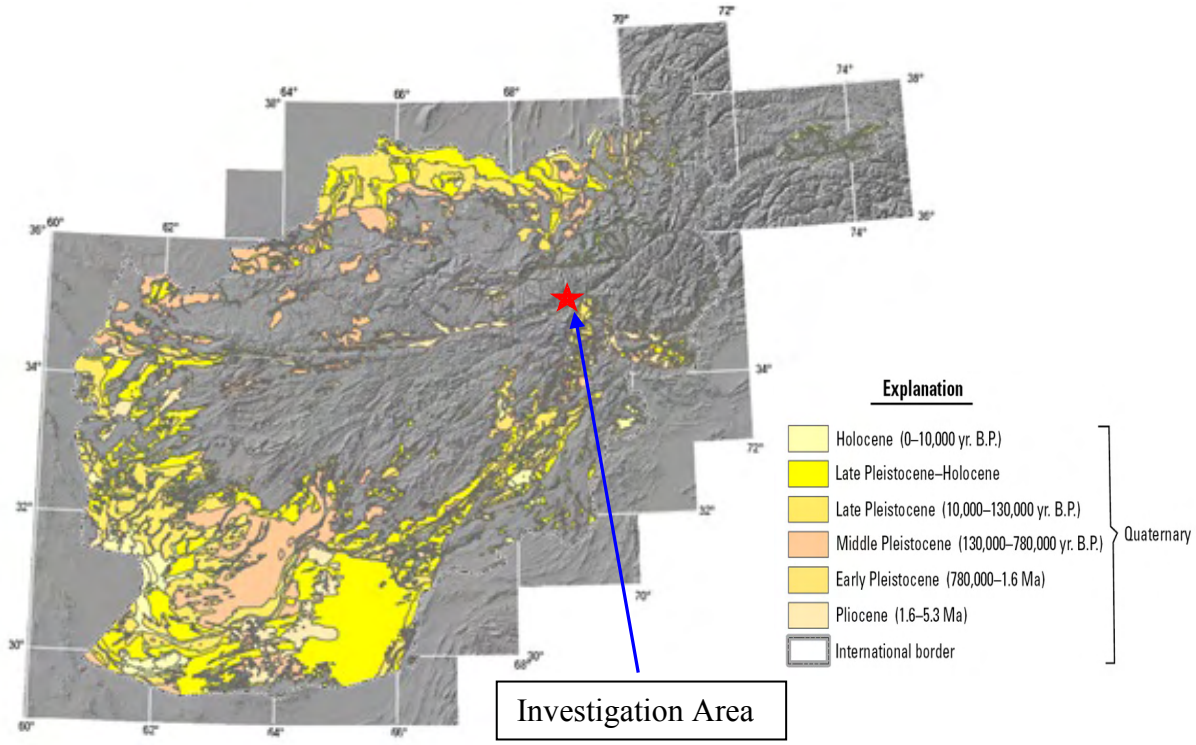


Figure No: 4. Quaternary geologic map of Afghanistan (from Doebrich and Wahl, 2006). Units are listed chronologically in the explanation. The Quaternary geology was previ-ously mapped by Abdullah and Chmyriov (1977) and is primarily confined to large basins in southwestern and north-central Afghanistan.

4.3. Probable and Possible Quaternary Faults in investigation area

Central Afghanistan Accreted Terranes

Domain-7 encompasses the Helmand blocka mountainous region composed of various terranes that were accreted throughout the Mesozoic and into Cenozoic time. This region is considered to be the most structurally complex part of Afghanistan (Shareq, 1981). This rugged highland is interspersed with valleys and basins, all of which have a general northeast trend (fig. 5). Most valleys are bounded by previously mapped fault systems (Abdullah and Chmyriov, 1977; Treloar and Izatt, 1993). Treloar and Izatt (1993) described northeast-trending, Miocene-Pliocene thrust faults and folds in this domain that created an inverted basin analogous to the Katawaz basin in the Sulaiman fold and thrust belt to the southeast. However, our observations suggest that in the current tectonic regime fault motion is mainly strike-slip, possibly along preexisting thrust faults.

Tapponnier and others (1986) suggested that the Helmand block is being actively extruded to the southwest between the left-lateral Chaman and the right-lateral Hari Rud fault systems. This model is consistent with the apparent strike-slip faulting we observe in this region.

Our mapping indicates that probable Quaternary faulting is primarily concentrated on northeast-trending lineaments that coincide with the Helmand (pl. 1, no. 121) and Dorafshan fault (pl. 1, no. 120) systems, and with the Farah Rud fault (pl. 1, no. 126) to the west (fig. 5). We propose that these systems are acting as synthetic, sinistral conjugate shear systems to the major Chaman fault to the east. We mapped other widely distributed possible and probable Quaternary surficial ruptures throughout the domain; these are minor structures that could transfer slip to larger structures.

The Farah Rud fault system coincides with a well-defined strike valley, and left-laterally displaces streams that cross the fault system. Our observations of Quaternary displacement are consistent with Whitney's (1984) report of Quaternary sinistral displacement on the fault. To the southwest, evidence of Quaternary faulting dissipates in the Helmand basin, where late Pleistocene–Holocene eolian deposits (Whit-ney, 2006) may be concealing the evidence of faulting.

Along the Darafshan fault zone (pl. 1, no. 120), we mapped discontinuous, sublinear fault scarps in bedrock terrain and along range fronts. The northern limit of this fault zone is marked by a prominent north-trending rectilinear basin that is approximately 25 km wide and 45 km long (pl. 1, no. 63). We interpret this basin to be a pull-apart basin between the left-lateral Chaman and Darafshan fault systems. In the central part of Domain 7, we mapped features along a linear,

90-km-long, northeast-trending range front that likely corresponds to the main trace of the Helmand fault. These features generally coincide with the bedrock-colluvium contact, and locally we observed old piedmont landforms and deposits that are left-laterally displaced. To the northeast, the Helmand fault system steps to the right, is more discontinuous and fragmented, and has little or no evidence of Quaternary activity.

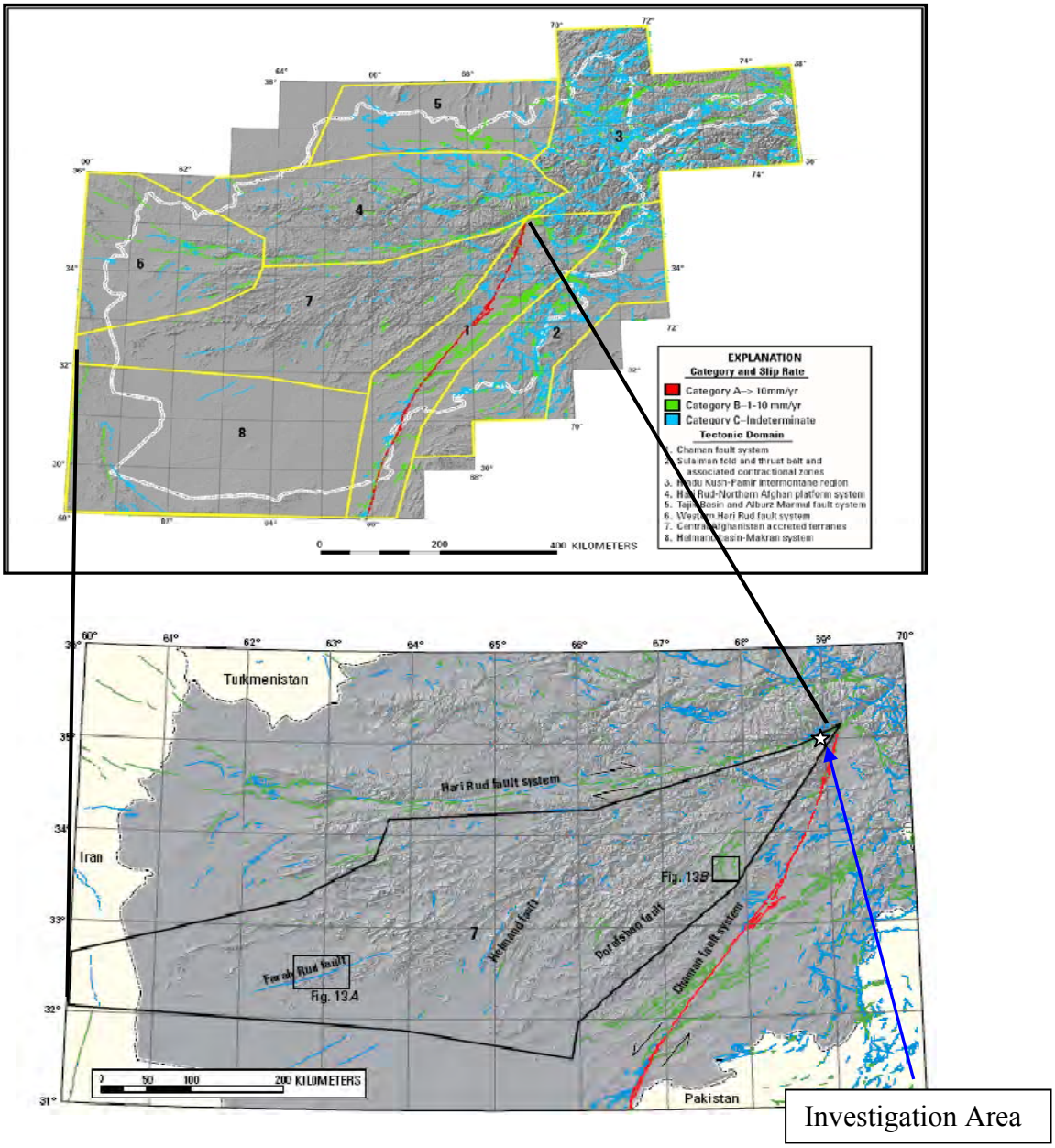


Figure 5. Tectonic domain 7—Central Afghanistan Accreted Terranes and the Helmand-Dorafshan fault system outlined in black. This structurally complex region consists of rugged northeast-trending mountains interspersed with valleys and basins. The region may be actively extruding to the southwest between the left-lateral Chaman fault system to the east and the right-lateral Hari Rud fault system to the north. Arrows indicates directions of movement on fault systems. Fault categories are category A, red; category B, green; and category C, blue.

4.4. Seismic Hazard of investigation area

Each year Afghanistan is struck by moderate to strong earthquakes, and every few years, a powerful earthquake causes significant damage or fatalities. As Afghanistan rebuilds following decades of war and strife, new construction and development need to be designed to accommodate the hazards posed by strong earthquakes.

Earthquakes in Afghanistan are most abundant in and near the northeastern part of the country where the effects of the plate collision between India and Asia are most pronounced. In this region, tectonic forces have created the mountains of the Hindu Kush and Pamir's along with frequent moderate to large earthquakes.

Historical accounts show that the damaging earthquakes have also occurred elsewhere, even in the seismically less active parts of the country; the map of earthquakes in Afghanistan shows that the frequency and size of earthquakes varies across the country and so does the hazard.

Table No:1. Probabilistic ground motions for selected cities (USGS, 2007).

			2%			10%		
			Probability of exceedance in 50 years					
City	Lat.	Long.	PGA (%g)	0.2 sec	1.0 sec	PGA	0.2 sec	1.0 sec
Kabul	34.53	69.17	48	113	53	25	57	22
Mazar-e Sharif	36.70	67.10	33	78	22	16	37	11
Herat	34.35	62.18	28	62	24	7	15	4
Kandahar	31.61	65.69	13	30	16	7	16	8

The long history of earthquakes throughout much of Afghanistan highlights the need to understand the level of hazard in various parts of the country. By combining our data on the locations, sizes, and frequencies of earthquakes with the locations and estimated activity rates of major faults, scientists can forecast the probable levels of future ground shaking. The likelihood of this shaking is represented on seismic-hazard maps; the maps show the probability of exceeding a certain strength of shaking in a 50-year time period. The hazard maps show that the likelihood of strong shaking in the next 50 years is highest in northeastern Afghanistan and along the corridor adjacent to the Chaman fault system .

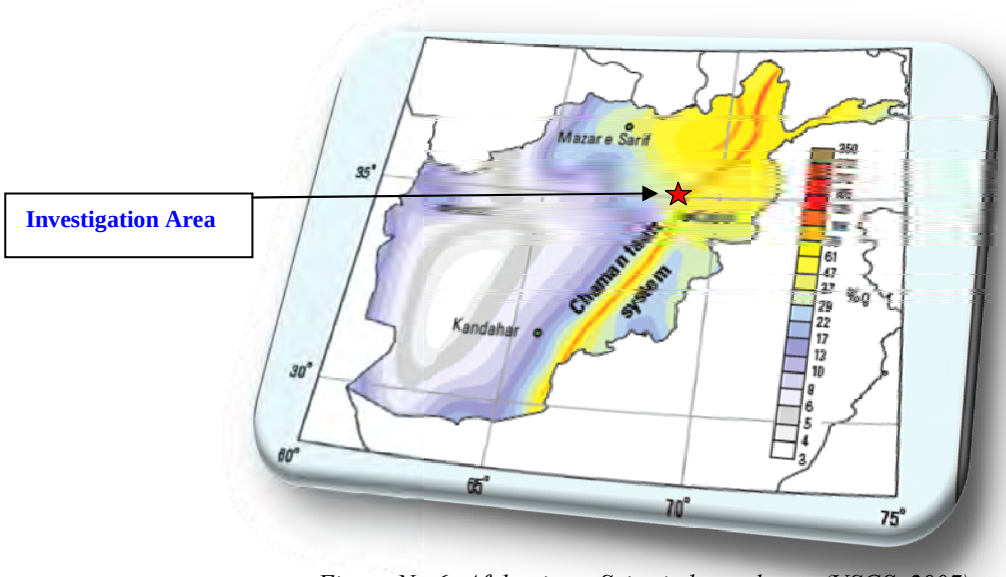


Figure No.6: Afghanistan Seismic hazard map (USGS, 2007)

Generalized seismic-hazard map of Afghanistan showing the level of shaking (peak ground acceleration measured as a percentage of the force of gravity, (g) that is likely to occur with a 2–percent probability in the next 50 years. This probability is equivalent to saying that the strength of shake at a particular site will probably be exceeded every 2,500 years. Warm colors show higher hazard, and cool colors show lower hazard. The strongest expected shaking is concentrated on major active faults in eastern and northeastern Afghanistan.

Figure No.7 Shows the Earthquake Hazard Map for Afghanistan. The star sign shows the area investigation. Peak acceleration is between 34% to 65% g and Seismic intensity and description of potential damage isVIII(Severe shaking furniture overturned and many unreinforced masonry building will Suffer moderate to Heavy Strutural damage and few will experince heavy to very heavy strutural damage).

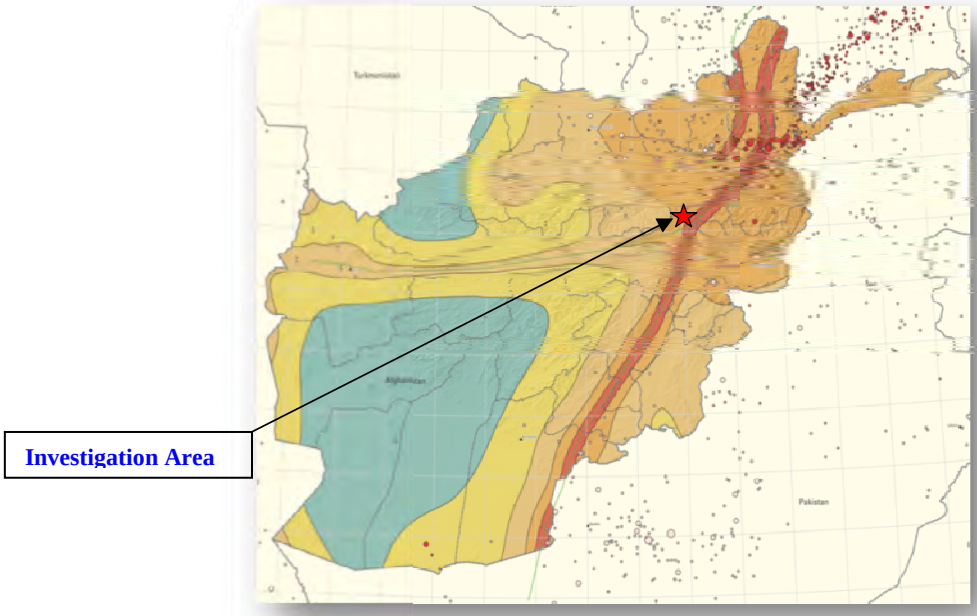


Figure No.7: Earthquake Hazard Map for Afghanistan, Peak Horizontal Acceleration with 2 Percent Probability of Exceedance in 50 years, By Oliver S. Boyd, Charles S. Mueller, and Kenneth S.Rukstales, 2007.

Peak acceleration (%g)	Seismic intensity and description of potential damage
< 0.17	I. Not felt, no items displaced, and no damage
0.17 - 1.4	II. Scarcely felt, no items displaced, and no damage III. Weak shaking, hanging objects swing slightly, and no damage
1.4 - 3.9	IV. Mild shaking, hanging objects swing, windows and doors rattle, and no damage
3.9 - 9.2	V. Moderate shaking, hanging objects swing considerably, precarious objects may fall over, and negligible damage to unreinforced masonry buildings
9.2 - 18	VI. Strong shaking with few people losing their balance, furniture may be shifted, and few unreinforced masonry buildings suffer slight structural damage
18 - 34	VII. Very strong shaking and difficult to stand, objects fall from shelves, and many unreinforced masonry buildings will suffer slight to moderate structural damage and few will experience moderate to heavy damage
34 - 65	VIII. Severe shaking, furniture overturned, and many unreinforced masonry buildings will suffer moderate to heavy structural damage and few will experience heavy to very heavy structural damage
65 - 124	IX. Violent shaking with people forcibly thrown to the ground, monuments and columns fall, and most unreinforced masonry buildings will suffer heavy to very heavy structural damage
> 124	X+. Extreme shaking, and most unreinforced masonry buildings will suffer very heavy structural damage

5- Geotechnical Investigation in this Project

5.1. Subsurface Investigation

5.1.1. Exploratory Borings, Test Pit Excavation and Sampling

For investigate of subsurface material description in proposed project area and subsurface soil conditions in proposed project area, according to Scope of Work documents of project for geotechnical study and AED design the field investigation included the following:

The borings were advanced through Core Drill Rig Machine to determine of engineering the characteristics of the subsurface materials of The field investigation included a reconnaissance of the this project site, Drilling of Boreholes with 6 meters Depth, Excavation of Test Pits with 3 meters Depth at the footing of Salang Tunnel Substation and performing standard penetration tests and obtaining disturbed split-barrel samples (per 0.75 meter) depths up to end of Test Pit and borehole.

For the purpose of subsurface soil classification, soil sampling, field density testing and laboratory soil tests, totally (3) three Boreholes drilled to a depth of 6 meters below the existing ground surface and in additional (7)Seven test pits were excavated toa depthof 3.0 metersbelow the existing ground surface.

Test Pit locations depicted on the Site Plan (Appendix A)

Boreholes drilling,Test Pit Excavation and Soil sampling were performed under the supervisor of Shawal geotechnical engineering representative,the Shawal geotechnical engineering representative extended detailed logs of the subsurface materials and conditions encountered during the boring and excavations, and collected representative samples.

Borehole and Test Pit Log depicted on (Appendix B, C)

The Boreholes Drilling and Test Pits Excavation were carried out on November 2013using XY-2Core Drill Rig Machine and Excavator on footprint of Salang Tunnel Substation Parwan Province, Afghanistan Project.

The Soil samples were obtained & SPT Test has performed (per 0.75 meter) depths in the Boreholes and Test Pits.

5.1.2. Field density test by sand cone method

for the determination of the in-place density and unit weight of undisturbed or in-situ soils in according to ASTM D-1556 used from this method. The soil or other material being tested should have sufficient cohesion or particle attraction to maintain stable sides on a small hole or excavation, and be firm enough to withstand the minor pressures exerted in digging the hole and placing the Apparatus over it, without deforming or sloughing.

Based on field density tests determined Natural Field Density varies between 1.729 gm/cc and 1.747 gm/cc.

5.1.3. Standard penetration test (SPT)

Standard penetration tests were performed During the sampling procedures in the Boreholes (per 0.75 meter) depths in conjunction with the split-barrel sampling. The standard penetration value (N) is defined as the number of blows of a 140-pound hammer, falling thirty inches, required to advance the split-spoon sampler One-foot into the soil (ASTM D-1586).

In this site area the SPT blow counts (N-Value) per ASTM D-1586 are in the in different strata in the range of 23 to >50blows counts.

- *The SPT values from 23 to >50blow counts, Relative Soil Density was classified as "Medium to Very Dense", (Table 2).*
- *The SPT values from 23 to >50blow counts Relative Soil Consistency was classified as "Very Stiff to Hard", (Table 3).*

Table 2. Relative Soil Density of Soils (Sand and Non Plastic Silt)

Relative Soil Density	Penetration Value (Blows/Ft)
Very Loose	0 - 4
Loose	5 - 10
Medium	11 - 30
Dense	31 - 50
Very Dense	Above 50

Table 3.Relative Soil Consistency (Clay and Plastic Silt)

Relative Soil Consistency	Penetration Value (Blows/Ft)
Very Soft	0 - 2
Soft	3 - 4
Medium Stiff	5 - 8
Stiff	9 - 16
Very Stiff	17 - 32
Hard	Above 32

The SPT-Resistance values (N-values), detailed description of the subsoils encountered and the depth at which samples were procured are shown on Field Test Result, (Appendix-D).

5.2. Modulus of Subgrade Reaction

- ***Evaluation of Subgrade for Roads***

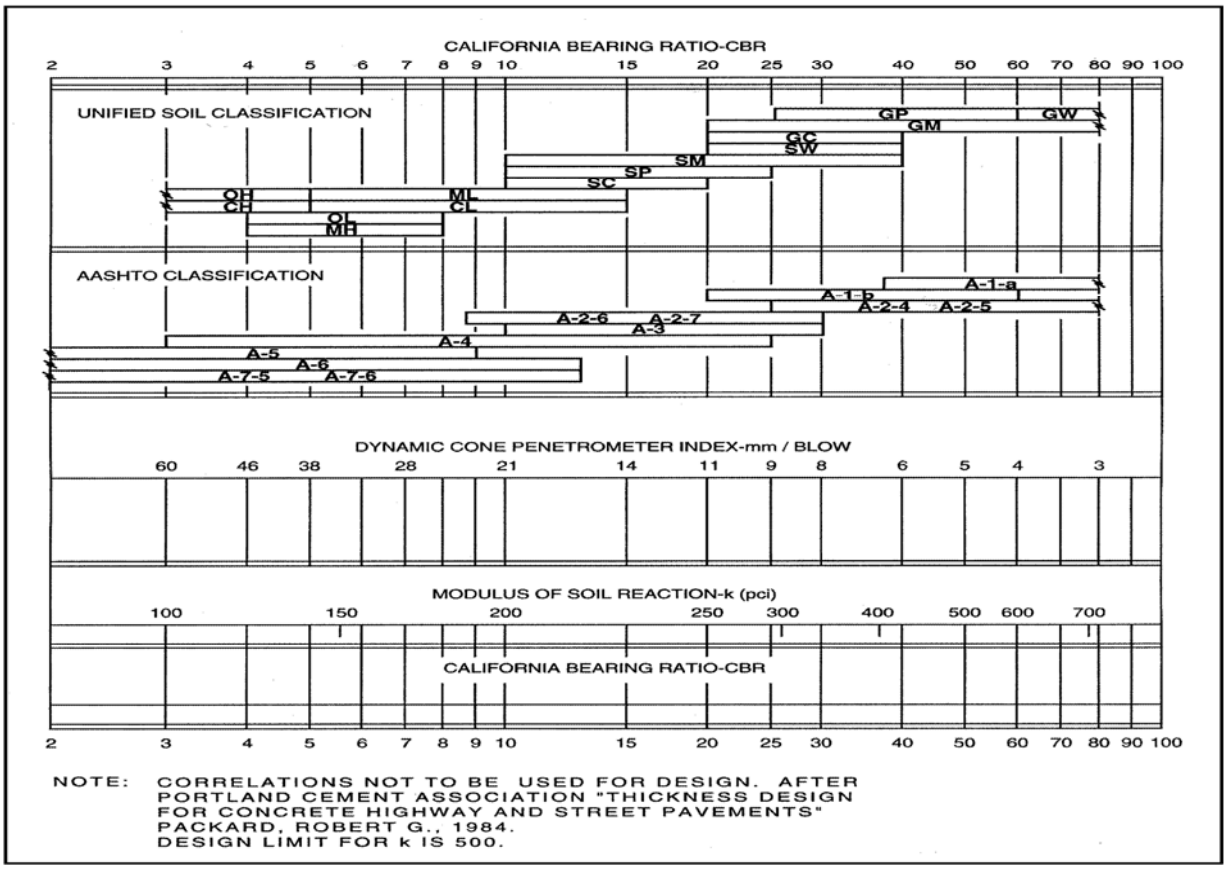
  Samples of the on-site soils were tested for Several points soaked CBR. The results of the tests are included in Summary table. The soaked CBR values against 95% maximum dry density and optimum moisture content obtained from modified ASTM compaction test vary between 12% and 26%. We recommend to use CBR of 12% for designing the road pavement.

- ***Modulus of Subgrade Reaction***

  The modulus of subgrade reaction is a conceptual relationship between soil pressure and deformation that is used in the structural analysis of foundations. It is determined by performing plate load test on the on-site soil. In the absence of this test data, modulus of subgrade reaction can be estimated from ACI 360-2006 based on CBR value. The modulus of subgrade reaction for 12% CBR value is about 210pciUFC 3-260-02, approximate relationships of soil classification and soil strength Reference Table.

UFC 3-260-02
30 June 2001

K-Value Determination



NOTE: CORRELATIONS NOT TO BE USED FOR DESIGN. AFTER PORTLAND CEMENT ASSOCIATION "THICKNESS DESIGN FOR CONCRETE HIGHWAY AND STREET PAVEMENTS" PACKARD, ROBERT G., 1984. DESIGN LIMIT FOR k IS 500.

5.3. Field and Laboratory Tests Summary Results

Summary result of all soil tests on representative soil samples in this project area has shown in following.

Test pits Summary test results

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

SUMMARY OF LABORATORY TESTING

PROJECT NAME:	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan
LOCATION	Parvan Province, Salang Tunnel Substation
CLIENT	USAID
CONTRACTOR	TETRA TECH

TP No.	Sample No.	Depth	NMC	SPT BLOWS	Particle Size Distribution (%) (ASTM D136)			Atterberg Limits (ASTM D4318)			Mod. Proctor (ASTM D 1557)		CBR (ASTM D 1883)	Direct Shear (ASTM D 3080)		Soil Classification (ASTM D 2487)	
		(m)	%	ASTM D 1586	Gravel	Sand	Silt & Clay	LL	PL	PI	MDD (gm/cm^3)	OMC (%)	%	c, kg/cm^2	ϕ (deg)	Symbol	Soil Description
TP-2	1	0.75	3.6	23	0	13	87	NP	NP	NP	**1.80**	**12**	**12**			(ML)	Silt
	2	1.50	4.9	32	1	15	84	NP	NP	NP				0.019	25.2	(ML)	Silt with sand
	2	2.25	6.5	35	8	11	81	NP	NP	NP						(ML)	Silt with sand
	3	3.00	8.5	35	9	8	83	NP	NP	NP						(ML)	Silt with sand
TP-3	1	0.75	4.5	35	15	68	17	NP	NP	NP						(SM)	Silty Sand with gravel
	2	1.50	5.1	36	15	73	12	NP	NP	NP						(SM)	Silty Sand with gravel
	2	2.25		Refusal												Boulder	Boulder
	3	3.00		Refusal												Boulder	Boulder
TP-4	1	0.75	4.2	35	35	47	18	NP	NP	NP	2.138	7.40	26			(SM)	Silty Sand with gravel
	2	1.50	4.9	38	40	47	13	NP	NP	NP						(SM)	Silty Sand with gravel
	3	2.25	5.6	40	40	47	13	NP	NP	NP						(SM)	Silty Sand with gravel
	4	3.00		Refusal												Boulder	Boulder
TP-5	1	0.75	3.9	36	33	51	16	NP	NP	NP						(SM)	Silty Sand with gravel
	2	1.50	4.5	37	24	64	12	NP	NP	NP						(SM)	Silty Sand with gravel
	3	2.25		Refusal												Boulder	Boulder
	4	3.00		Refusal												Boulder	Boulder
TP-6	1	0.75	3.7	26	16	71	13	NP	NP	NP						(SM)	Silty Sand with gravel
	2	1.50	4.5	33	16	71	13	NP	NP	NP						(SM)	Silty Sand with gravel
	3	2.25	5.1	35	16	70	14	NP	NP	NP						(SM)	Silty Sand with gravel
	4	3.00	5.9	38	37	49	14	NP	NP	NP						(SM)	Silty Sand with gravel
TP-7	1	0.75	3.9	26	41	45	14	NP	NP	NP	2.183	7.80	21.8			(SM)	Silty Sand with gravel
	2	1.50	5.1	28	43	44	13	NP	NP	NP						(SM)	Silty Sand with gravel
	3	2.25	5.6	29	36	51	13	NP	NP	NP						(SM)	Silty Sand with gravel
	4	3.00	6.9	38	48	31	21	NP	NP	NP						(SM)	Silty Sand with gravel
TP-8	1	0.75	2.6	30	17	57	26	NP	NP	NP						(SM)	Silty Sand with gravel
	2	1.50	4.3	34	39	44	17	NP	NP	NP				0.00	33.4	(SM)	Silty Sand with gravel
	3	2.25		Refusal												Boulder	Boulder
	4	3.00		Refusal												Boulder	Boulder

Prepared By
Checked By
Date

Borehole Summary test results

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

SUMMARY OF LABORATORY TESTING

PROJECT NAME:	Geotechnical Exploration for Salang Tunnel Substation, Afghanistan
LOCATION	Parvan Province, Salang Tunnel Substation
CLIENT	USAID
CONTRACTOR	TETRA TECH

BH No.	Sample No.	Depth	NMC	SPT BLOWS	Particle Size Distribution (%) (ASTM D136)			Atterberg Limits (ASTM D4318)			Direct Shear (ASTM D 3080)		Soil Classification (ASTM D 2487)	
		(m)	%	ASTM D 1586	Gravel	Sand	Silt & Clay	LL	PL	PI	kg/cm²	φ (deg)	Symbol	Soil Description
BH-2	1	0.75	4.3	27	20	45	35	NP	NP	NP			(SM)	Silty Sand with gravel
	2	1.50		Refusal									Boulder	Boulder
	3	2.52		Refusal									Boulder	Boulder
	4	3.00		Refusal									Boulder	Boulder
	5	4.50		Refusal									Boulder	Boulder
	6	6.00		Refusal									Boulder	Boulder
BH-3	1	0.75	3.6	30	37	43	20	NP	NP	NP	0	30	(SM)	Silty Sand with gravel
	2	1.50		Refusal									Boulder	Boulder
	3	2.25		Refusal									Boulder	Boulder
	4	3.00		Refusal									Boulder	Boulder
	5	4.50		Refusal									Boulder	Boulder
	6	6.00		Refusal									Boulder	Boulder
BH-6	1	0.75	3.2	35	22	41	37	NP	NP	NP			(SM)	Silty Sand with gravel
	2	1.50		Refusal									Boulder	Boulder
	3	2.25		Refusal									Boulder	Boulder
	4	3.00		Refusal									Boulder	Boulder
	5	4.50		Refusal									Boulder	Boulder
	6	6.00		Refusal									Boulder	Boulder

Prepared By
Checked By
Date

6.Geotechnical Evaluations and Recommendations

6.1. Foundation Design Requirements

Subsoil conditions disclosed by boreholes and open test pits at locations shown on the site plan indicates that the stratigraphy, in Appendix-C Test Pit Log and Appendix-B Borehole Log. And also the Basic subsoil parameters used in the engineering analyses are summarized below:

In designing foundations, the engineer must satisfy two independent foundation stability requirements, which must be met simultaneously:

- *It is important to There should be an adequate safety against shear failure within the soil mass. (The working loads should not exceed the allowable bearing capacity of the soil being built upon).*
- *The probable maximum and differential settlements of the soil under any part of the foundations must be limited to safe and tolerable limits.*

6.1.1. Foundation Level

- *Based on soil investigations and soil test results, all footings shall be located below the frost line at minimum 800mm.*
- *From aspect of topsoil passing, according to site investigation results, Maximum thickness of Top soil (arable soil) is 300 mm. This Topsoil should be removed under all foundations.*
- *Therefore, minimum foundation level in all area should be located at minimum 800 mm in depth from NGL (Natural Ground Level).*

6.1.2. Selection the Type of Foundations

Selection of the particular type of foundation depends upon the character of the soil, the presence of ground water at the site, the magnitude of the imposed loads, and the project characteristics, and also to choose the type of foundation consider which is not merely safe but also economical.

There the ultimate and allowable bearing capacities are calculated, in all locations of site for this type of soils, the type of soil and relevant bearing capacities are determined in next Item, you can use the Flowing type of foundations respect to building characteristics with their allowable bearing capacities.

- *We suggest using all type of foundation such as Single, Strip and Mat footings Suggested with combined Reinforced concrete (R.C) just with considering the calculated Bearing capacity.*

6.2. Recommendations about Compaction

For the placement and compaction of the embankment and sub grade fill, loose lift thickness should generally not exceed 20 cm. The moisture content of the fill material should be controlled to within ±1.5% of the optimum moisture content for the field compaction effort applied. Each layer is compacted to not less than the percentage of maximum density. It is generally important to specify a high degree of compaction in fills under structures to minimize settlement and to ensure stability of a structure. The following factors should be considered in establishing specific requirements:

(1) The sensitivity of the structure to total and differential settlement as related to structural design is particularly characteristic of structures to be founded partly on fill and partly on natural ground.

(2) If the ability of normal compaction equipment to produce desired densities in existing or Locally available materials within a reasonable range of placement water content are considered essential, special equipment should be specified.

(3) The compaction requirements for clean, cohesionless, granular materials will be generally higher than those for cohesive materials, because cohesionless materials readily consolidate, or liquify, when subjected to vibration.

For coarse-grained, well-graded, cohesionless soils with less than 4 percent passing the No. 200 sieve, or for poorly graded cohesionless soils with less than 10 percent, the material should be compacted at the highest practical water content, preferably saturated. Compaction by vibratory rollers generally is the most effective procedure. Experience indicates that pervious materials can be compacted to an average relative density of 85 + 5 percent with no practical difficulty. For cohesionless materials, stipulate that the fill be compacted to either a minimum density of 85 percent relative density or 95 percent of CE 55 compaction effort, whichever gives the greater density.

(4) If it is necessary to use fill material having a tendency to swell, the material should be compacted at water contents somewhat higher than optimum and to no greater density than required for stability under proposed loadings. The bearing capacity and settlement characteristics of the fill under these conditions should be checked by laboratory tests and analysis. Swelling clays can, in some instances, be permanently transformed into soils of lower plasticity and swelling potential by adding a small percentage of hydrated lime.

6.3. Recommendations about Excavation and backfilling

6.3.1. Backfill Material Specifications

6.3.1.1. Satisfactory Materials

- *Satisfactory materials comprise any materials classified by ASTM D 2487 as GW, GW-GM, GW-GC, SW, SW-SM, or SW-SC and free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, or objectionable materials.*

Satisfactory materials for grading comprise stones less than 75 mm, except for fill material for pavement and building areas which comprise stones less than 75 mm in any dimension.

6.3.1.2. Unsatisfactory Materials

- *Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include trash; refuse; manmade fills and backfills containing debris from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.*

- *The materials to be used for general backfilling purposes shall be of selected fill composed of sand and or granular mixture free from organic matter or other deleterious substances, the plasticity index of the backfill material shall not exceed 5 percent. It shall be spread in lifts not exceeding 25cm in compact thickness, moisture conditioned to its optimum moisture content, and compacted to a dry density not less than 95% of the maximum dry density as obtained by Modified Proctor test (ASTM D-1557).*

- *All technical requirements for backfill material and limitations should be considered*

6.3.2. General Backfilling Criteria

- *Above the foundation level and under the slab on grade coarse grained soil used for filling shall be clean, free from clay lumps, organic matters and any treatment of the subgrade should extend out0.50 meters from each side of building footprint.*
- *Sand and gravel shall be brought from quarries approved by the consultant.*
- *At least 95% of maximum dry density in accordance with ASTM, D1556 andD1557 standard, must be achieved for the Replacement layer.*

- *under the foundation need compaction, compact material to average relative density of 95% with no individual test less than 95% maximum density in accordance with ASTM, D1556 and D1557standards.*
- *density in accordance with ASTM, D1556 and D1557standards.*
- *Compact the fill using suitable mechanical tamping equipment (a smooth vibrating roller would be better choice) to obtain specified density.*
- *Perform field density control test for every 150 m2 of fill at locations specified by consultant.*
- *Correct and/or re-compact materials do not meet specified compaction requirements. Continue corrective measures until required relative density has been achieved.*
- *Care shall be taken during filling, so as not to damage concrete surfaces, water proofing materials, joints or membranes that have been applied to concrete surfaces.*
- *The Perimeter Security Wall shall be constructed according to the Standard Design detail in the appendix.. Inside grade shall in all cases be higher than outside grade. The ground grade shall slope away from the wall for at least 5 meters and shall be kept a minimum of 3.0 meters below the top of wall for a minimum distance of 10 meters.*
- *The boundary of any compacted back-fill material shall extend 0.50 meters from each side of building footprint.*
- *Do not fill against any part of walls, or columns until each part has reached the required design strength and has been approved by the consultant.*
- *Bring back-fill up uniformly around building and individual wall units.*
- *Do not fill against foundations, walls, footing, and other area until concrete forms have been removed, masonry work has been pointed and protected, and concrete finishing, damp proofing, and waterproofing have been completed and approved.*

6.3.3. Structural fill

For structural fill the material specification shall be limited to GW or SW material with less than 12% fines (#200 sieves) and a gradation coefficient of curvature of less than 3.5. This material shall be compacted to a minimum 95% lab MDD as determined by modified proctor test. Sub grade shall be compacted to 90% lab MDD and may require compaction on the dry side using padded or sheep foot compactor which kneads the soil. Do not use vibratory rollers for this type of soil sub grade compaction.

6.4. Calculations of the Bearing Capacity

Calculations of the Bearing Capacity The ultimate bearing capacity is the loading intensity that causes failure and lateral displacement of foundation materials and rapid settlement. The ultimate bearing capacity depends on the size and shape of the loaded area, the depth of the loaded area below the ground surface, groundwater conditions, the type and strength of foundation materials, and the manner in which the load is applied. The design bearing pressure equals the ultimate bearing capacity divided by a suitable factor of safety.

For evaluate the Allowable bearing capacity there are different methods as below:

1st) Allowable Bearing Capacity based on new edition Terzaghi equation (Braja, M.Das, Principle of Geotechnical Engineering, 5th edition, 2002).

1st Procedure

Based on new edition Terzaghi equation Allowable Bearing Capacity Calculation

For calculation of the Allowable bearing capacity based on the physical and mechanical parameters of soil and foundation dimensions, has used the new Terzaghi ultimate bearing capacity equation.

Terzaghi suggest below equation for calculation of Ultimate Bearing Capacity for Shallow Foundations:

For Rigid and Square Foundation and d≥B:

Then we will use Local Shear Failure Formula via Terzaghi new edition:

(Reference: Braja, M.Das, Principle of Geotechnical Engineering, 5th edition, 2002)

Qu = 1.3cNc + qNq+0.4γBNγ

Qu = Ultimate Bearing capacity (KN/m^2)

Ground Water Level (GWL) not encountered to the water Table in dig borehole to 6 meter below the ground surface.

And:

Nc, Nq, Nγ = Coefficients have selected from the reference table

[Reference: Braja, M.Das, 2002, chapter 15, table 15-1 page 510]

For finding the values parameters on equation:

According to direct shear test results minimum

Φ = Angle of internal friction (Degrees),

C = Cohesion of soil (KN/m^2),

C = 0 (KN/m2) Φ = 33.4 °~33°

According to field density test results:

γ (minimum Natural field density) = 1.729 gm/cc Equals 16.96KN/m2

According to (Braja, M.Das, 2002) Table for φ= 33º

Nc =48.09 Nq =32.23 Nγ = 31.94

Wide of Foundation (B) =1 m for Example

Depth of Foundation (Df) =for Df=0.8 m

Safety Factor (SF) =S.F= 3

q = Surcharge= γ D_f

q = γ Df = 16.96× 0.8 = 13.56KN/m2

Back to Equation:

Qu = 1.3cNc + qNq+0.4 γBNγ

Qu = (1.3×0×48.09) + (13.56×32.23) + (0.4×16.96×1×31.94)

Qu = 0+437.19+ 216.63 (KN/m2)

Qu = 653.81(KN/m2)

And

$$\text{Qa (Allowable Bearing Capacity)} = \frac{\text{Qu}}{\text{SF}}$$

Qa=653.81/3=217.94 KN/m ^{2}Equal=2.222 kg/cm^2 …….For B =1 meter

Note:

The Calculated soil bearing capacity is assumed for a footing wide (B) of 1 meters.

If footing designed per design documents that the footing wide (B) are Small or larger than 1 meter the allowable bearing capacity will change according to this formula:

Qa = 0+145.72+72.21B (KN/m2)

6.5. Calculation and Estimation of the Settlement

Table No: 5. List conditions that cause settlements which occur during construction and result in only minor problems and post-construction settlements which occur after a structure is completed or after critical features are completed. Differential settlements distort a structure. A structure can generally tolerate large uniform, or nearly uniform, settlements.

Generally, essential conditions for occurrence the consolidation Settlement are:

1. Existence of clay soils

2. Shallow water table level

According to lab Test Findings of sieve analysis, Atterberg limits the below Results are achieved:

General soil type in this project area

[SM], [Silty Sand with gravel and Boulder].

Also, according to collect Field data regarding groundwater table in the project area, Ground Water Level (GWL) not encountered to the water Table in dig borehole to 6 meter below the ground surface.

Therefore, according to soil Type and groundwater table possibility of occurrence Consolidation settlement is not possible.

Table: No.5. Causes of Settlements [Reference: UFC 3-220-03FA, table 5.1, Page 5.2]

Cause	Comment
Compression of foundation soils under static loads.	Soft, normally consolidated clays and peaty soils are most compressible. Loose silts, sands, and gravels are also quite compressible.
Compression of soft clays due to lowering ground-water table.	Increased effective stress causes settlement with no increase in surface load.
Compression of cohesionless soils due to vibrations.	Loose sands and gravels are most susceptible.Settlement can be caused by machine vibrations, earthquakes, and blasts.
Compression of foundation soil due to wetting.	Loose silty sands and gravels are most susceptible.Settlements can be caused by rise in groundwater table or by infiltration.
Shrinkage of cohesive soils caused by drying.	Highly plastic clays are most susceptible.Increase in temperature under buildings containing ovens or furnaces may accelerate drying. Wetting of highly plastic clays can cause swelling and heave of foundations.
Loss of foundation support due to erosion.	Waterfront foundations must extend below maximum erosion depth.
Loss of foundation support due to excavation of adjacent ground.	Most pronounced in soft, saturated clays.
Loss of support due to lateral shifting of the adjacent ground	Lateral shifting may result from landslides, slow downhill creep, or movement of retaining structures.
Loss of support due to formation of sinkhole.	Soils overlying cavernous limestone and broken conduits are susceptible.
Loss of support due to thawing of permafrost.foundation heat.	Permafrost should be insulated from
Loss of support due to partial or complete liquefaction.	Loose, saturated sands are most susceptible.
Downdrag on piles driven through soft clay.	Loading on piles is increased by negative skin friction if soil around upper part of pile settles.

U. S. Army Corps of Engineers

(Principles of Geotechnical Engineering, Braja M. Das, 2nd 1941 zand 5th edition, 2002)

S_t = *Total Settlement*

S_e = *immediate settlement*

S_c = *primary consolidation settlement* } ≈ 0

S_s = *secondary consolidation settlement*

➢ ***immediately Settlement Estimation for this Project According To below.***

(Principles of Geotechnical Engineering, Braja M. Das, 2nd edition):For Rigid Foundation:

$$S_e = \frac{Bq_0}{E_s}(1-\mu^2)\alpha_r$$

Table No: 6. The values of αr for various types of foundation, [Reverence: Berja. M. Das,

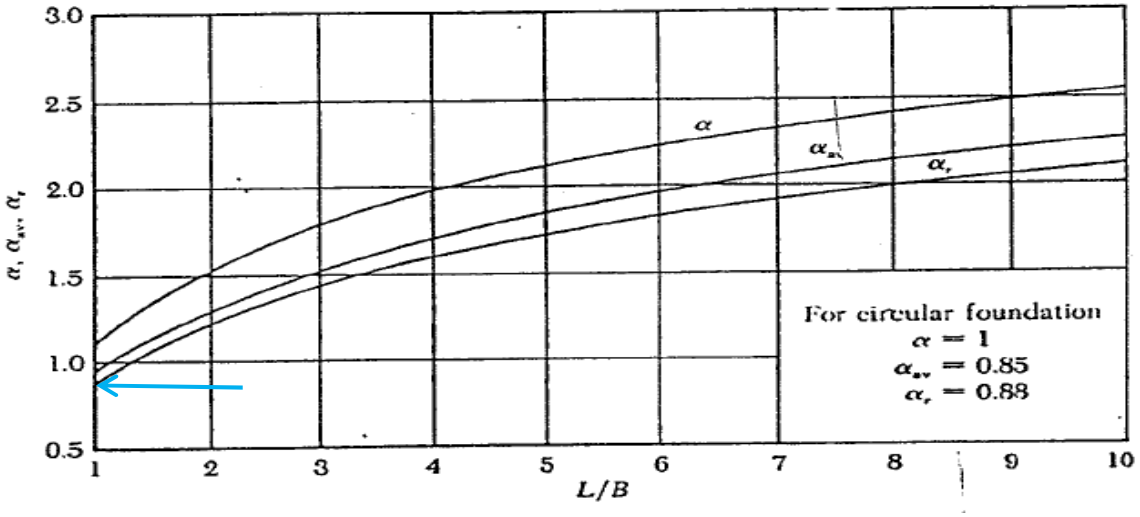


Table no.7. Representative Values of Poisson's Ratio for soils
[Reference: Berja. M. Das, 2002, p262, table 10-3]

Soil type	*Poisson's Ratio (μs)*
Loose sand	*0.2-0.4*
Medium dense sand	*0.25-0.4*
Dense sand	*0.3-0.45*
Silty sand	*0.2-0.4*
Soft clay	*0.15-0.25*
Medium dense clay	*0.2-0.5*

Table No.8. Representative Values of the Modulus of Elasticity of soils, [Reference: Berja. M. Das, 2002, p262, table 10-2]

	Elasticity Modulus (Es)	
Soil Type	***Kg/cm2***	***KN/m2***
Soft clay	*18.5-35*	*1800-3500*
Hard clay	*60-140*	*6000-14000*
Loose sand	*105-280*	*10000-28000*
Dense sand	*350-700*	*35000-70000*

$$S_e = \frac{Bq_0}{E_s}(1-\mu^2)\alpha_r$$

B= width of foundation (1 meter): for Example.

q_0 = net pressure applied or surcharge pressure 217.94 (kN/m2).

Es= module of elasticity (from Representative Values of the Modulus of Elasticity of soils [Reference: Berja. M. Das, 2002, p262, table 10-2]) (Table no:8) = 10000 KN/m2 for Loose sand..

μ= Poisson's ratio [Table No.7] = 0.2 for Loose sand.

αr = from table (L/B =1) where L (length) and B (width) of foundation= 0.9 [Table No.6]

$$S_e = \frac{Bq_0}{E_s}(1-\mu^2)\alpha_r$$

$$S_e = \frac{1\times qo}{10000}(1-0.2^2)0.9$$

For B=1m Se= 0. 01883(m)

Final Suggestion for immediate Settlement:

we suggest the estimating settlement by formula:

$$S_e = \frac{Bq_0}{E_s}(1-\mu^2)\alpha_r$$

For B=1m Se= 0. 01883(m)

6.6.Lateral Earth Pressure Calculation

There are categories of lateral earth pressure and each depends upon the movement experienced by the vertical wall on which the pressure is acting.

The three categories are:

- *At rest earth pressure*
- *Active earth pressure*
- *Passive earth pressure*

Calculation of Lateral Earth Pressure Coefficients:

According to the direct shear test result, minimum of friction angle (ϕ) of soil is 33° and Cohesion (C) ≈ 0.00Kpa.

At Rest Earth Pressure Coefficient (K0): $k_0 = 1 - \sin\phi$

$K_0 = 1 - Sin\,\emptyset \longrightarrow K_0 = 1 - Sin\,33 \longrightarrow K_0 = 0.46$

Active Earth Pressure Coefficient (Ka):

$Ka = tan^2\left[45 - \frac{\emptyset}{2}\right] \longrightarrow Ka = tan^2\left[45 - \frac{33}{2}\right] \longrightarrow K_a = 0.29$

Passive Earth Pressure Coefficient (Kp):

$Kp = tan^2\left[45 + \frac{\emptyset}{2}\right] \longrightarrow Kp = tan^2\left[45 + \frac{33}{2}\right] \longrightarrow K_p = 3.39$

Sliding:

$\mu = tan\,\delta = \tan 23 = 0.42$(typical between concrete and soil)

6.7.General Geotechnical Comment and Limitation

Following are the comments and limitations of our report:

- *This report presents results of the geotechnical investigations, conducted through 3borehole with 6 meter depth, 7 test pits with3meter depth below the existing grade.*
- *The analyses, conclusions and recommendations contained in this report are based on site conditions, as they existed at the time of field investigations and further on the assumption that the boreholes and test pits are representative of the subsurface conditions throughout the site.*
- *This report has been prepared for the construction of Salang Tunnel Substation, Parwan Province, Afghanistan.*

- *Paragraphs, statements, test results, boring logs, diagrams etc., should not be taken out of context and should not be utilized for any other structure at any site.*

6.8. Conclusions and Recommendations

- *The following conclusions and recommendations are made based on the results of geotechnical investigations carried out at the Salang Tunnel Substation, Parwan Province, Afghanistan site:*

The general sub soils type at the project site per ASTM D-2487-06 (Unified Soil Classification System) standard consist of [SM], [Silty Sand with gravel and Boulder].

a) *Final Suggestion for Allowable Bearing Capacity*

Allowable Bearing Capacity based on new edition Terzaghi equation, equal to

Qa=2.222 kg/cm^2…….For B =1 meter

b) *Final Suggestion for immediate Settlement:*

we suggest estimating the settlement by formula:

$$S_e = \frac{Bq_0}{E_s}(1-\mu^2)\alpha_r$$

For B=1m Se= 0. 01883 (m)

c) *Ground Water Level (GWL)* *not encountered to the water Table in dig borehole Up to 6 meter below the ground Surface.*

d) *Based on the subsoil conditions, the proposed buildings may be supported on spread footings placed at a depth not less than 0.8 m depth below the existing ground level.*

e) *We suggest using all type of foundation such as Single, Strip and Mat footings Suggested with combined Reinforced concrete (R.C) just with considering the calculated Bearing capacity.*

6.9. Closure

We trust that this report will assist you in the design and construction of the proposed project. Shawal Geotechnical Engineering/Materials Testing Laboratory appreciates the opportunity to provide our services on this project and looks forward to working with you during construction and on future projects. Should you have any questions, please do not hesitate to contact us.

This report was prepared by Shawal Geotechnical Engineering/Materials Testing Laboratory.

This report was prepared in accordance with current, generally accepted geotechnical engineering practices. No other warrantee is provided.

Shawal Geotechnical Engineering/Materials Testing Laboratory should be allowed the opportunity to review the geotechnical aspects of plans and specifications prior to construction, to allow confirmation of the correct interpretation of the recommendations provided in this report.

7.References

1) ASTM Standards

- *ASTM D-422 - Standard Test Method for Particle-Size Analysis of Soils*
- *ASTM D-854 - Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer*
- *ASTM D-2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*
- *ASTM D-2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System)*
- *ASTM D-4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils*
- *ASTM D-1586 - Standard Test Methods for Penetration Test and Split-BarrelSampling of Soils*
- *Collapse Potential Test (ASTM D 5333)*
- *ASTM D 3080 – Standard Test Method for Direct Shear test of soil under Consolidated Drained condition*
- *ASTM D 1556 – Standard Test Method for density and Unit Weight of soil in place by the Sand Cone Method*

2) UNIFIED FACILITIES CRITERIA (UFC)

- *Geotechnical Engineering Procedures for Foundation Designs and Structures*
- *Soils and Geology Procedures for Foundation design Building and other Structures*
- *Soil Mechanics*

3) INTERNATIONAL BUILDING CODE (IBC)

- *International building code 2006, section 1804, page 345, Table 1804.2*

4) Reference Books

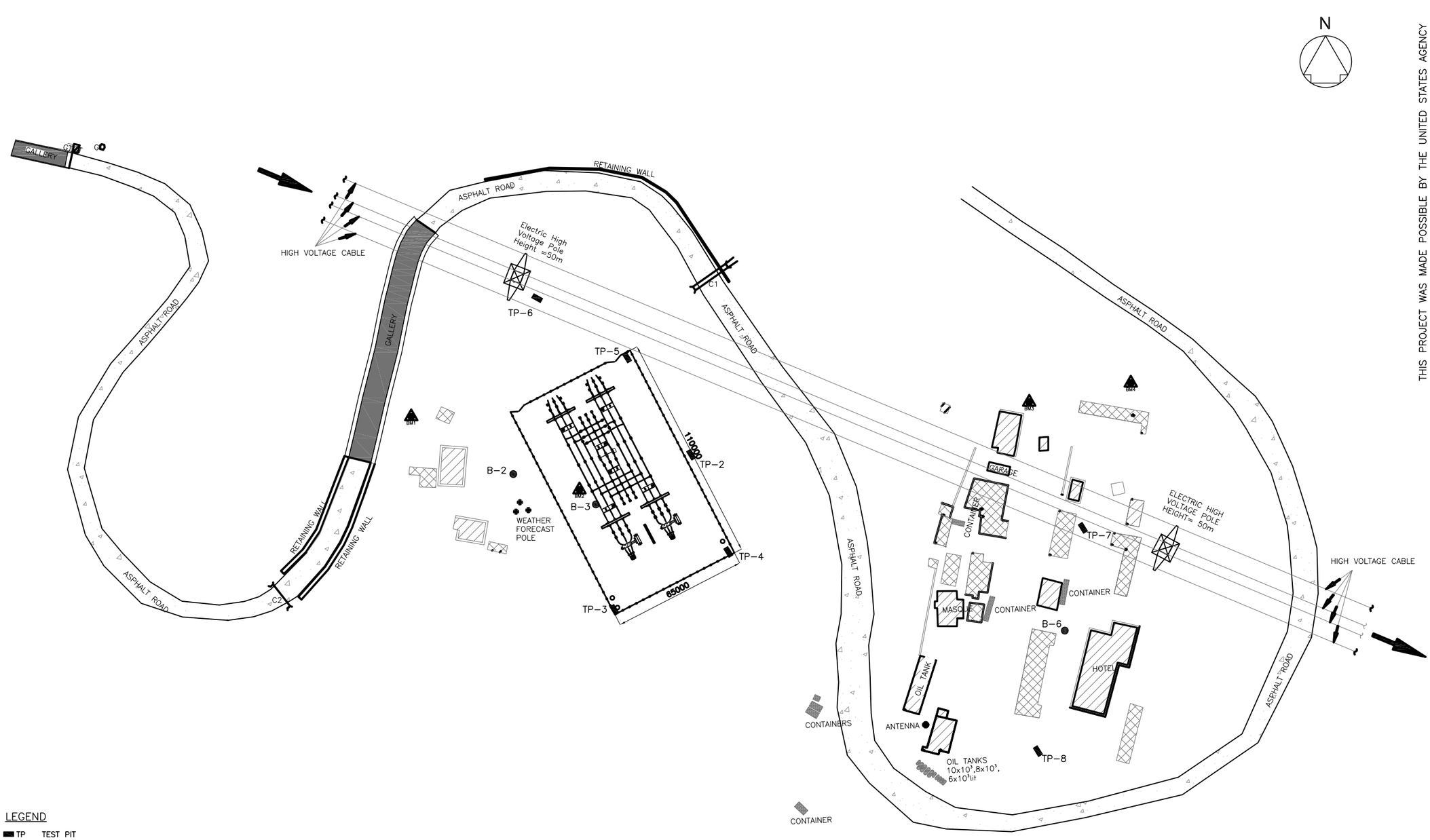
- *Principles of Geotechnical Engineering, Braja M. Das, 2nd edition, 1941.*
- *Principles of Geotechnical Engineering, Braja M. Das, 5th edition, 2002.*

5) And:

- *US Army Corps of Engineers, Afghanistan Engineer District, AED Design Requirements, Geotechnical Investigations (Provisional).*

Appendix A

Location Map of Boreholes and Test Pits



LEGEND

- TP TEST PIT
- B BOREHOLE

BOREHOLES AND TEST PITS LOCATION PLAN

SCALE: 1:1000

UNLESS OTHERWISE NOTED, LINEAR DIMENSIONS SHOWN ARE IN MILLIMETERS.

NOTE: A3 SIZE REDUCED TO HALF SCALE

THIS PROJECT WAS MADE POSSIBLE BY THE UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT AND THE GENEROUS SUPPORT OF THE AMERICAN PEOPLE THROUGH USAID GLOBAL ARCHITECTURE AND ENGINEERING IQC CONTRACTS

XXX SUBMITTAL

SYMB	SUBMITTAL/REVISION DESCRIPTION	DATE	APR

DESIGNED BY: DATE:
DRAWN BY: SUBMITTED BY:
CHECKED BY: CAD FILE NAME:

USAID FROM THE AMERICAN PEOPLE

AESP

USAID – OEGI
SALANG TUNNEL SUBSTATION

SHEET REFERENCE NUMBER:

P:\1298\Work Orders\WO-LT\WO-LT-0063 Salang Tunnel SS Technical Sections\CAD\Survey\Dwg\131113_Boreholes and Test Pits Location Plan.dwg 11/13/2013 2:02:54 PM Safai, Ahmad Shekib

Appendix B

Boreholes Log

Geological Log

LOG OF BH# 02

Completion Depth Of Borehole: 6 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'45.90"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'43.93"
Sub-Contractor	:Shawal GMTL.	Depth:	6.00 m	Surface Elevations=	3213 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with Gravel	SM	0.75	8-11-15-(26)	○
		100	Refusal Border		1.5	Refusal	
1.5		100			2.25	Refusal	
2.25		100			3	Refusal	
3		100	Boulder Assumed		3.75	Refusal	
3.75		100			4.5	Refusal	
4.5		100			5.25	Refusal	
5.25		100			6	Refusal	
6							

Remark...

NOTE

1-CONTINUAL SOIL SAMPLE RECOVERED FROM BOREHOLE AND STORED IN WOODEN BOXES.

Drilling Method :	Geotechnical Rotary Core Drilling (ASTM D-2113)
Sampling Method :	Continuous Soil Sampling - Split Spoon
SPT Hammer :	63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586

Geotechnical Engineer: Eng.Enayatullah

Geological Log

LOG OF BH# 03

Completion Depth Of Borehole: 6 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'44.57"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'44.70"
Sub-Contractor :	Shawal GMTL.	Depth:	6.00 m	Surface Elevations=	3207 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
		100	Silty Sand with Gravel	SM			
0.75			Refusal Border		0.75	6-13-14-(27)	○
		100					
1.5					1.5	Refusal	
		100					
2.25					2.25	Refusal	
		100					
3			Boulder Assumed		3	Refusal	
		100					
3.75					3.75	Refusal	
		100					
4.5					4.5	Refusal	
		100					
5.25					5.25	Refusal	
		100					
6					6	Refusal	

Remark...

NOTE

1-CONTINUAL SOIL SAMPLE RECOVERED FROM BOREHOLE AND STORED IN WOODEN BOXES.

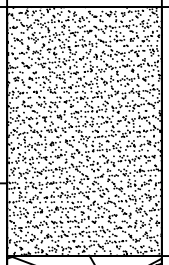
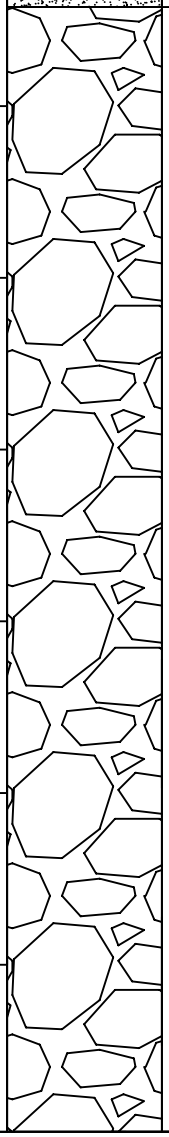
Drilling Method :	Geotechnical Rotary Core Drilling (ASTM D-2113)
Sampling Method :	Continuous Soil Sampling - Split Spoon
SPT Hammer :	63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF BH# 06

Completion Depth Of Borehole: 6 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'43.79"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'54.90"
Sub-Contractor :	Shawal GMTL.	Depth:	6.00 m	Surface Elevations=	3166 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with Gravel	SM	0.75	9-11-14-(25)	○
		100	Refusal Border				
1.5		100	Boulder Assumed		1.5	Refusal	
2.25		100			2.25	Refusal	
3		100			3	Refusal	
3.75		100			3.75	Refusal	
4.5		100			4.5	Refusal	
5.25		100			5.25	Refusal	
6		100			6	Refusal	

Remark...

NOTE

1-CONTINUAL SOIL SAMPLE RECOVERED FROM BOREHOLE AND STORED IN WOODEN BOXES.

Drilling Method :	Geotechnical Rotary Core Drilling (ASTM D-2113)
Sampling Method :	Continuous Soil Sampling - Split Spoon
SPT Hammer :	63.5-Kg/30 inch drop-Split Spoon via ASTM D-1586
Geotechnical Engineer:	[redacted]

Appendix C

Test Pits Log

Geological Log

LOG OF TP# 02

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'46.52"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'47.33"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3200 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silt	ML	0.75		
1.00		100					
1.55					1.5		
2.00		100	Silt with sand	ML			
2.25					2.25		
3.00		100			3		

Remark...

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

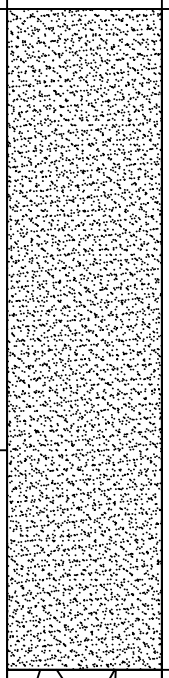
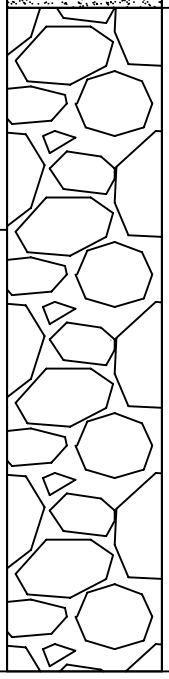
Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF TP# 03

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'44.19"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'46.05"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3200 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00		100					
1.55		100	Refusal Border		1.5		
2.00							
2.25			Boulder Assumed		2.25		
3.00		100			3		

Remark...

NOTE
1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]r

Geological Log

LOG OF TP# 04

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates	N= 35°17'44.95"
Contractor:	TETRA TECH	Weather:	Sunny		E= 69° 3'48.01"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3192 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00							
1.55		100			1.5		
2.00							
2.25		100	Refusal Border		2.25		
3.00			Boulder Assumed		3		

Remark...

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF TP# 05

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'48.03"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'45.64"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3213 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00		100					
1.55			Refusal Border		1.5		
2.00		100					
2.25			Boulder Assumed		2.25		
3.00		100			3		

Remark...

NOTE
1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF TP# 06

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'48.39"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'43.97"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3205 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00		100			1.5		
1.55		100			2.25		
2.00		100			3		
2.25							
3.00							

Remark...

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF TP# 07

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates	N= 35°17'45.30"
Contractor:	TETRA TECH	Weather:	Sunny		E= 69°3'55.39"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3164 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00		100			1.5		
1.55		100			2.25		
2.00		100			3		
2.25							
3.00							

Remark...

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Geological Log

LOG OF TP# 08

Completion Depth Of Test Pit: 3 (meter)

Client :	USAID	Location :	Parwan Province	Coordinates N=	35°17'42.10"
Contractor:	TETRA TECH	Weather:	Sunny	E=	69° 3'53.98"
Sub-Contractor:	Shawal GMTL.	Depth:	3.00 m	Surface Elevations=	3163 m
Project:	Salang Tunnel Substation, Parwan Province, Afghanistan	Water Table:	Dry		

DEPTH (M)	GRAPHIC LOG	CORE RECOVERY (%)	MATERIAL DESCRIPTION	USCS CLASSIFICATION	Depth of SPT Test (m)	BLOW COUNTS (N VALUE)	SPT/ (N VALUE) 10 20 30 40
0.75		100	Silty Sand with gravel	SM	0.75		
1.00							
1.55		100			1.5		
			Refusal Border				
2.00		100					
2.25			Boulder Assumed		2.25		
3.00		100			3		

Remark...

NOTE

1- LITHO LOGICAL LOG WAS COMPLETED AFTER LAB TESTING AND REVIEWED BY LAB MANAGER.

Excavation Method :	By Excavator Machine
Sampling Method :	By Hand / Field Technician
SPT Hammer :	140-lb/30in-Auto Drop
SS:	Split Spoon soil Sampling (ASTM D-1586)
Geotechnical Engineer:	[redacted]

Appendix D

Field Test Results

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Field Density Test for Soil ASTM D 1556

Project Name	**Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan**	**Contractor**	**TETRA TECH**
Project Location	**Parvan Province, Salang Tunnel Substation**	**Client**	**USAID**
sample location	**TP No. (2, 3,5,6,7)**	**Project No.**	**KSC-229**

Location	TP-2	TP-3	TP-5	TP-6	TP-7		
Determination of Moisture inSoils by Means of a Calcium Carbide Gas Pressure Moisture Tester AASHTO T-217 ,ASTM D 4944							
Percent of Moistur Based on Wet Mass	**3.9**	**4.0**	**4.1**	**3.7**	**4.3**		
Percent of Moistur Based on Dry Mass	**4.06**	**4.2**	**4.3**	**3.8**	**4.5**		
Field Density							
Depth m	**0.75**	**0.75**	**0.75**	**1.5**	**1.5**		
Pit No.	TP-2	TP-3	TP-5	TP-6	TP-7		
Field density							
Wt. of wet material from hole	**5147**	**5063**	**5264**	**5044**	**5213**		
Wt. of sand +cylinder before Pouring	**8000**	**8000**	**8000**	**8000**	**8000**		
Wt. of sand +cylinder after Pouring	2198	2258	2134	2284	2133		
Wt. sand in cone	**1650**	**1650**	**1650**	**1650**	**1650**		
Wt. sand in Hole	4152	4092	4216	4066	4217		
Bulk density of sand	**1.399**	**1.399**	**1.399**	**1.399**	**1.399**		
Volume of sand in hole	2968	2925	3014	2906	3014		
Wet Density	1.734	1.731	1.747	1.736	1.729		
Result							
Dry Density	1.667	1.662	1.675	1.671	1.655		

Tested by		Signature	
Date			
Checked By		Signature	
Date			

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SPT BLOWS

PROJECT Name:	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		
LOCATION	Parvan Province, Salang Tunnel Substation		
CLIENT	USAID		
CONTRACTOR	TETRA TECH	Date SPT Record:	9-Nov-13

BH No.	Depth m	SPT Blows			
		15cm	30cm	45cm	" N Value"
BH No.2	0.75	8	11	15	26
	1.50	Refusal			
	2.25	Refusal			
	3.00	Refusal			
	3.75	Refusal			
	4.50	Refusal			
	5.25	Refusal			
	6.00	Refusal			
BH No.3	0.75	6	13	14	27
	1.50	Refusal			
	2.25	Refusal			
	3.00	Refusal			
	3.75	Refusal			
	4.50	Refusal			
	5.25	Refusal			
	6.00	Refusal			
BH No.6	0.75	9	11	14	25
	1.50	Refusal			
	2.25	Refusal			
	3.00	Refusal			
	3.75	Refusal			
	4.50	Refusal			
	5.25	Refusal			
	6.00	Refusal			
		End of Test BH			

Explanations:

Name & Signature Date	Field Data Logged by:	Prepared & Checked by:		Reviewed by:

Shawal GEMTL

Shawal Geotechnical Engineering /Materials Testing Laboratory

SPT BLOWS

PROJECT Name:	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		
LOCATION	Parvan Province, Salang Tunnel Substation		
CLIENT	USAID		
CONTRACTOR	TETRA TECH	Date SPT Record:	9-Nov-13

TP No.	Depth m	SPT Blows			
		15cm	30cm	45cm	" N Value"
TP No.2	0.75	6	14	21	35
	1.50	7	13	24	37
	2.25	5	16	23	39
	3.00	6	14	26	40
TP No.3	0.75	6	13	22	35
	1.50	8	12	24	36
	2.25	Refusal			
	3.00	Refusal			
TP No.4	0.75	7	16	19	35
	1.50	8	13	25	38
	2.25	9	18	22	40
	3.00	Refusal			
TP No.5	0.75	8	14	22	36
	1.50	7	15	22	37
	2.25	Refusal			
	3.00	Refusal			
TP No.6	0.75	8	11	15	26
	1.50	7	14	19	33
	2.25	8	15	20	35
	3.00	9	16	22	38
TP No.7	0.75	7	10	16	26
	1.50	6	9	19	28
	2.25	5	11	18	29
	3.00	8	12	26	38
TP No.8	0.75	8	11	19	30
	1.50	7	13	21	34
	2.25	Refusal			
	3.00	Refusal			
	End of Test Pit				

Explanations:

Name & Signature Date	Field Data Logged by:	Prepared & Checked by:		Reviewed by:

Appendix E

Test Pits Laboratory Soil Test Results

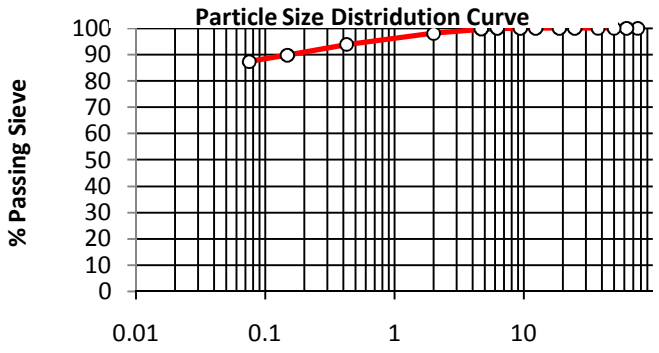
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 2	**Soil Description.**	Silt		
Test Pit No.	TP # 2 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	1952.0
B	Wt. of Dry Sample After Washing	g	246.7
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1705.3
D	%tage of Mat'ls Passing 75µm (no. 200)	g	87.4
E	Natural Moisture Content	%	3.6

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	0	0.0	100.0	100	
1/2	12.5	0	0.0	100.0	100	
3/8	9.5	0	0.0	100.0	100	
1/4	6.3	2.7	0.1	99.9	100	
# 4	4.75	6.7	0.3	99.7	100	
# 10	2.00	37.2	1.9	98.1	98	
# 40	0.425	119.5	6.1	93.9	94	
# 100	0.150	198.1	10.1	89.9	90	
# 200	0.075	245.8	12.6	87.4	87	



Summary of S,Analysis

Gravel	**0.0 %**
Sand	**13.0 %**
%200 Sieve	**87.0 %**
N.Moisture	**3.6**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

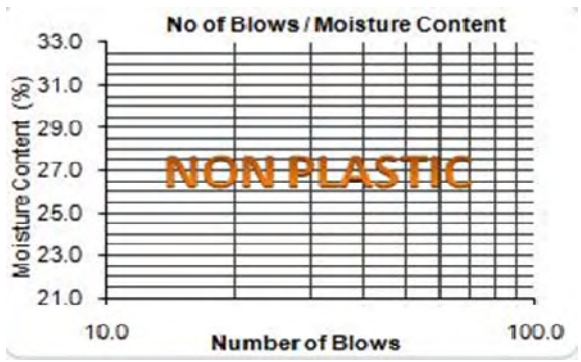
A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

NON PLASTIC

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(ML)	Silt



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

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ShawalGeotechnical Engineering /Materials Testing Laboratory

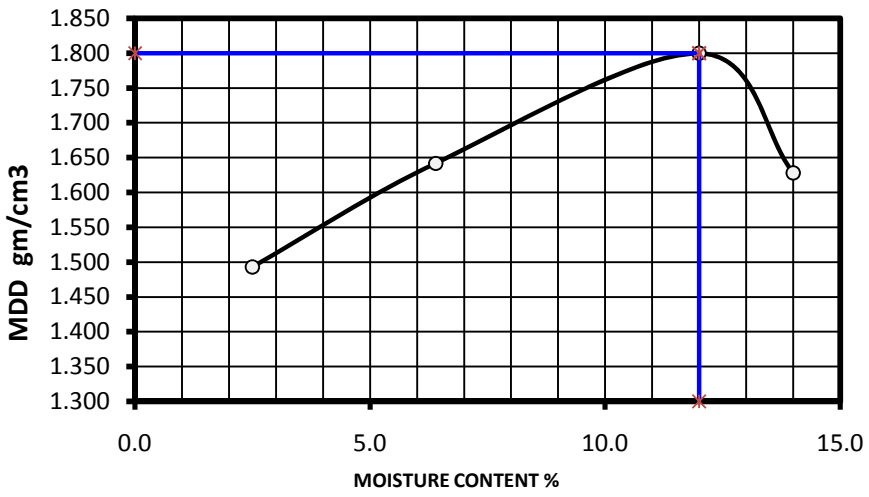
#

Client.	**USAID**			**Job No.**	Scl -2
Project	**Geotechnical Explorationn for Salang Tunnel Substation**			**Testing Date.**	11/10/2013
Contractor	**TETRA TECH**			**Sampled by.**	Shawal
Contract No.	**KSC-229**			**Witnessed by.**	Contractor Rep.
Location	**Test Pit No # 2**	**Depth(m)**	**0.75 M**		

Line	**Proctor**		**1**	**2**	**3**	**4**	**5**	**6**
A	Mass of Mould, Base & Specimen	gm	9623	10083	10655	10315		
B	Mass of Mould & Base plate	gm	6370	6370	6370	6370		
C	Mass of Specimen, (A - B)	gm	3253	3713	4285	3945		
D	**Wet Density,** *W1 =(A-B)/ volume*	gm/cm^3	**1.530**	**1.747**	**2.016**	**1.856**		

Line	**Moisture Content Determination**		**1**	**2**	**3**	**4**	**5**	**6**
E	Container No.	no	**C - 9**	**C - 4**	**C - 7**	**C - 12**		
F	Mass of Wet Soil & Container	g	284.6	566.4	279.5	297.5		
G	Mass of Dry Soil & Container	g	278.6	534.7	255.4	266.8		
H	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	6.0	31.7	24.1	30.7		
J	Mass of Dry Soil, (G -H)	g	238.0	496.1	201.2	219.3		
K	**Moisture Content,** *w =(I /J)x100*	**%**	**2.5**	**6.4**	**12.0**	**14.0**		

Line	**Dry Density of Soil**		**1**	**2**	**3**	**4**	**5**	**6**
L	**Dry Density,** *W= [D/(K+100)]x100*	gm/cm^3	**1.493**	**1.642**	**1.800**	**1.628**		
M	**Dry Density,** *W= (L*62.43)*	PCF	**93.2**	**102.5**	**112.4**	**101.6**		



TEST METHOD	**ASTM D-1557**
DROP HEIGHT	**18in/457 mm**
COMPACTION TYPE	**Manual**
RAMMER WEIGHT	**4.54 Kg**
MOULD WEIGHT gm	**6370**
MOULD VOLUME gm/cm^3	**2125.4**
BLOWS/LAYER	**56**
(OMC)%	**12.0**
(MDD) gm/cm^3	**1.800**
(NMC)%	**4.3**

Lab Manager QC

Shawal GEMTL

Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID					**Date Sampled :**	11/10/2013
Project.	Geotechnical Explorationn for Salang Tunnel Substation					**Contractor.**	TETRA TECH
Material Source.	Test Pit No # 2	Depth of (M)	0.75 m				

Density Calculation of Mould

Blows	**10 Blows**	**30 Blows**	**65 Blows**
Mould No.	1	2	3
Mould+Samples (A)	10824.2	11134.0	10880.6
Mould (B)	6872.0	6957.0	6690.0
Sample (A-B)	3952.2	4177.0	4190.6
Cont. + Wet Sample	415.3	395.6	339.7
Cont. + Dry Sample	375.2	357.7	307.9
Wt of container	40.6	41.6	42.6
Wt of water	40.1	37.9	31.8
Wt of dry soil	334.6	316.1	265.3
Water Content %	**12.0**	**12.0**	**12.0**
Mould Volume	2108	2136	2052.0
Wet Density gm/cm^3	1.875	1.956	2.042
Dry Density gm/cm^3	**1.674**	**1.746**	**1.823**

Swell Record (mm)

Date	**Duration**	**10 Blows**	**30 Blows**	**65 Blows**
Initial		0.0	0.0	0.0
Final		0.0	0.00	0.00
Swelling %		0.00	0.00	0.00

Load/Penetration Record — *PLUNGER AREA cm^2* 19.354 — R.F = 4.24

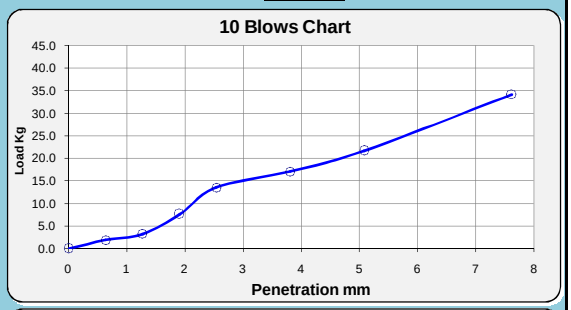
Std	**Penet.**	**10 Blows**		**30 Blows**		**65 Blows**	
Load	**mm**	**Readings**	**Load kg/cm^2**	**Readings**	**Load kg/cm^2**	**Readings**	**Load kg/cm^2**
	0.00	0.0	0.0	0.0	0.0	0.0	0.0
	0.64	9.0	1.97	18.0	3.9	13.0	2.8
	1.27	15.0	3.29	28.0	6.1	41.0	9.0
	1.91	35.0	7.67	62.0	13.6	78.0	17.1
70.3	**2.54**	62.0	**13.6**	76.0	**16.6**	95.0	**20.8**
	3.81	78.0	17.09	98.0	21.5	141.0	30.9
105.5	**5.08**	99.0	**21.7**	101.0	**22.1**	157.0	**34.4**
	7.62	156.0	34.18	182.0	39.9	212.0	46.4

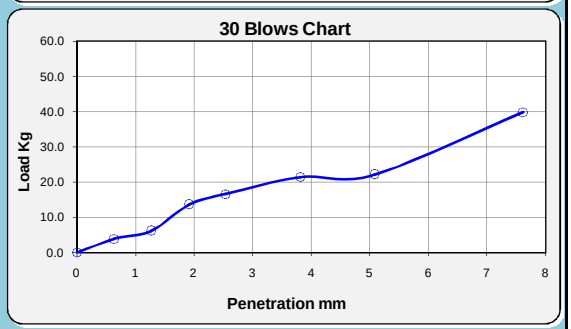
SUMMARY OF CBR TEST

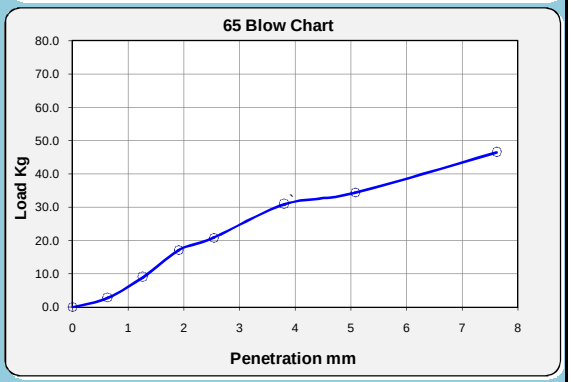
Tests Results	**10-Blows**	**30-Blows**	**65-Blows**
CBR % at 2.54$_{mm}$	**13.6**	**16.6**	**20.8**
CBR % at 5.08$_{mm}$	**21.7**	**22.1**	**34.4**
Correct CBR%@2.54mm	**19.3**	**23.7**	**29.6**
Compaction Rate %			
MDD (g/cm^3) (-)19mm	1.800		
OMC %	12.0		
ADJUSTED MDD(g/cm3			

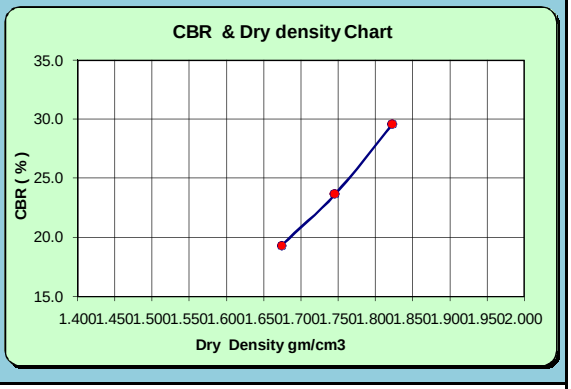
		CBR %
CBR @ 95 % Dry density	**1.710 gm/cm3**	**12.0 %**
CBR @ 100% Dry density	**1.800 gm/cm3**	**18.0 %**

Graphics:









Lab Manager QC

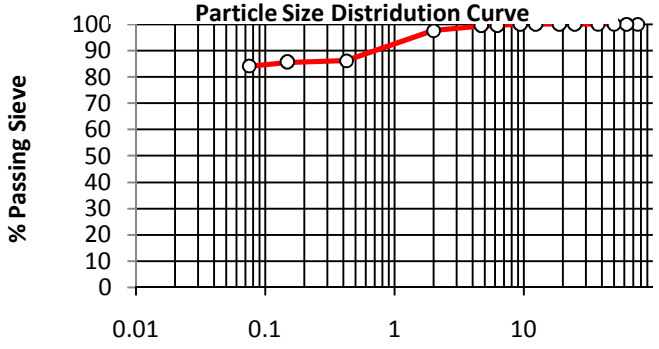
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 2		**Soil Description.**	Silt with sand			
Test Pit No.	TP # 2	**Witnessed by.**	Contractor Rep.	**Sampled by.**		Shawal Lab by Field Team,	
Depth of (M)	1.50 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	1558.0
B	Wt. of Dry Sample After Washing	g	243.5
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1314.5
D	%tage of Mat'ls Passing 75µm (no. 200)	g	84.4
E	Natural Moisture Content	%	4.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	0	0.0	100.0	100	
1/2	12.5	0	0.0	100.0	100	
3/8	9.5	0	0.0	100.0	100	
1/4	6.3	6.5	0.4	99.6	100	
# 4	4.75	9.5	0.6	99.4	99	
# 10	2.00	37.9	2.4	97.6	98	
# 40	0.425	214.6	13.8	86.2	86	
# 100	0.150	225.6	14.5	85.5	86	
# 200	0.075	246.8	15.8	84.2	84	



Summary of S,Analysis

Gravel	1.0 %
Sand	15.0 %
%200 Sieve	84.0 %
N.Moisture	4.9

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

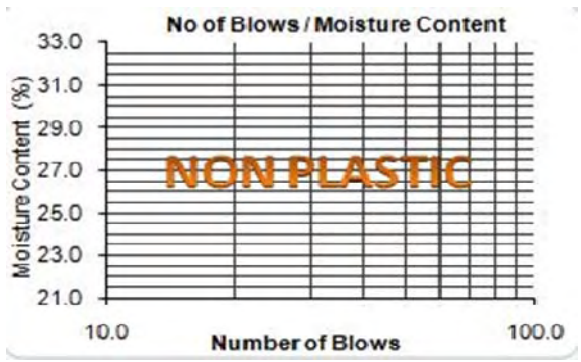
A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

NON PLASTIC

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(ML)	Silt with sand



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

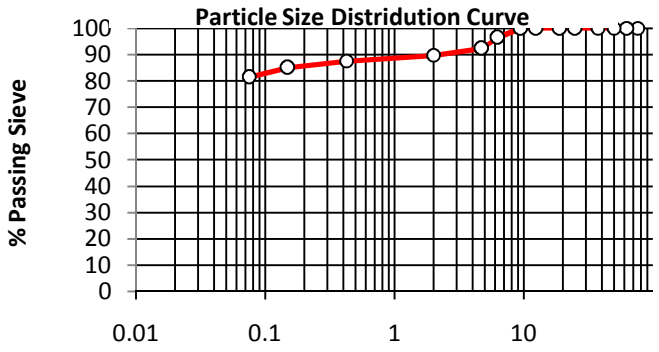
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 2	**Soil Description.**	Silt with sand		
Test Pit No.	TP # 2 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	1648.0
B	Wt. of Dry Sample After Washing	g	326.6
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1321.4
D	%tage of Mat'ls Passing 75µm (no. 200)	g	80.2
E	Natural Moisture Content	%	6.5

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	0	0.0	100.0	100	
1/2	12.5	0	0.0	100.0	100	
3/8	9.5	0	0.0	100.0	100	
1/4	6.3	56.9	3.5	96.5	97	
# 4	4.75	125.6	7.6	92.4	92	
# 10	2.00	168.9	10.2	89.8	90	
# 40	0.425	205.1	12.4	87.6	88	
# 100	0.150	245.8	14.9	85.1	85	
# 200	0.075	305.8	18.6	81.4	81	



Summary of S,Analysis

Gravel	8.0 %
Sand	11.0 %
%200 Sieve	81.0 %
N.Moisture	6.5

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

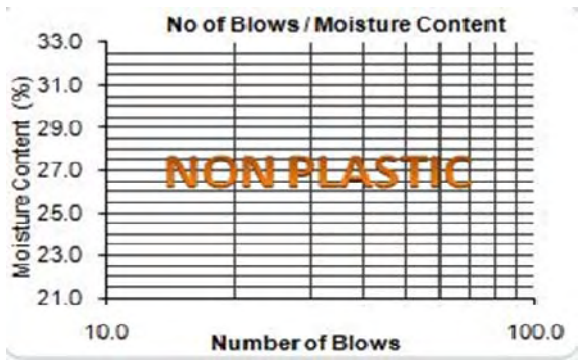
A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

NON PLASTIC

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(ML)	Silt with sand



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

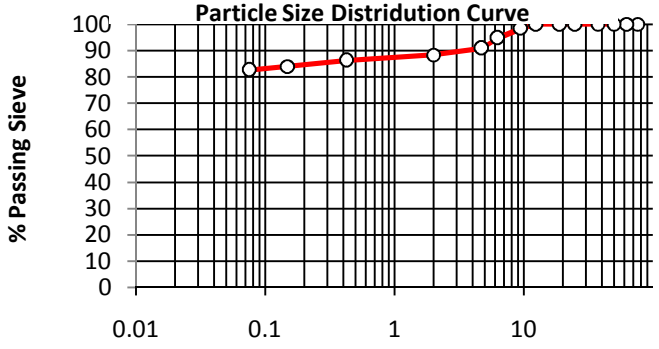
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 2	**Soil Description.**	Silt with Sand		
Test Pit No.	TP # 2 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	3.00 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	1725.6
B	Wt. of Dry Sample After Washing	g	322.5
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1403.1
D	%tage of Mat'ls Passing 75µm (no. 200)	g	81.3
E	Natural Moisture Content	%	8.5

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	0	0.0	100.0	100	
1/2	12.5	0	0.0	100.0	100	
3/8	9.5	25.8	1.5	98.5	99	
1/4	6.3	89.7	5.2	94.8	95	
# 4	4.75	156.6	9.1	90.9	91	
# 10	2.00	199.8	11.6	88.4	88	
# 40	0.425	236.7	13.7	86.3	86	
# 100	0.150	276.9	16.0	84.0	84	
# 200	0.075	299.6	17.4	82.6	83	



Summary of S,Analysis

Gravel	9.0 %
Sand	8.0 %
%200 Sieve	83.0 %
N.Moisture	8.5

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

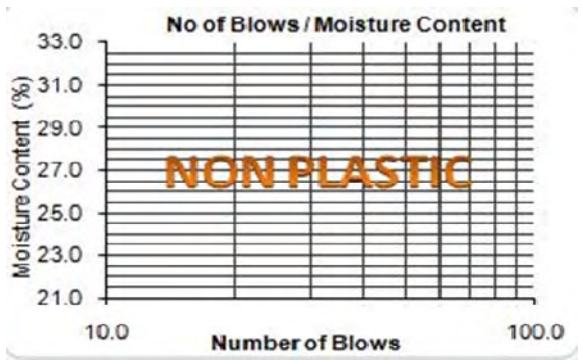
			4 D	2 D	3 D	4 D
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

NON PLASTIC

PLASTIC LIMIT

			4 D	4 D	Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(ML)	Silt with Sand



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

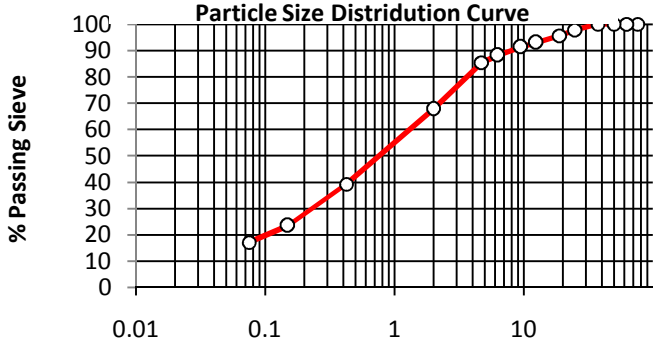
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 3	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 3 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2165.5
B	Wt. of Dry Sample After Washing	g	1956.8
C	Wt. of Mat'ls Loss During Washing (A - B)	g	208.7
D	%tage of Mat'ls Passing 75µm (no. 200)	g	9.6
E	Natural Moisture Content	%	4.5

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	47	2.2	97.8	98	
3/4	19	93.6	4.3	95.7	96	
1/2	12.5	149.8	6.9	93.1	93	
3/8	9.5	186.3	8.6	91.4	91	
1/4	6.3	255.5	11.8	88.2	88	
# 4	4.75	314.5	14.5	85.5	85	
# 10	2.00	696.7	32.2	67.8	68	
# 40	0.425	1315.2	60.7	39.3	39	
# 100	0.150	1656.1	76.5	23.5	24	
# 200	0.075	1794	82.8	17.2	17	



Summary of S,Analysis

Gravel	**15.0 %**
Sand	**68.0 %**
%200 Sieve	**17.0 %**
N.Moisture	**4.5**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

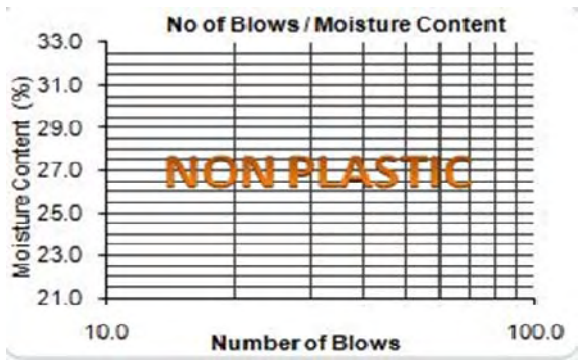
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

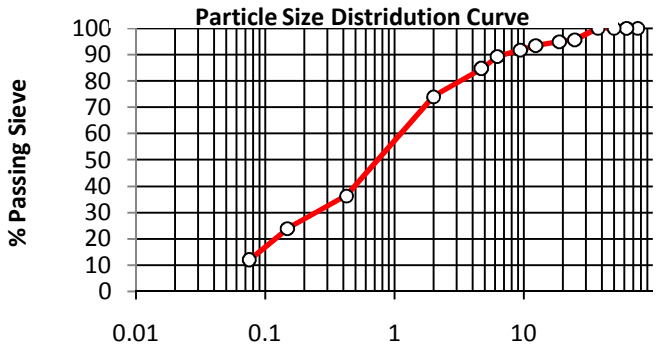
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 3	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 3 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	1968.6
B	Wt. of Dry Sample After Washing	g	1722.1
C	Wt. of Mat'ls Loss During Washing (A - B)	g	246.5
D	%tage of Mat'ls Passing 75µm (no. 200)	g	12.5
E	Natural Moisture Content	%	5.1

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	86.6	4.4	95.6	96	
3/4	19	99.6	5.1	94.9	95	
1/2	12.5	128.5	6.5	93.5	93	
3/8	9.5	162.8	8.3	91.7	92	
1/4	6.3	208.9	10.6	89.4	89	
# 4	4.75	304.2	15.5	84.5	85	
# 10	2.00	512.1	26.0	74.0	74	
# 40	0.425	1254.5	63.7	36.3	36	
# 100	0.150	1498.6	76.1	23.9	24	
# 200	0.075	1735.6	88.2	11.8	12	



Summary of S,Analysis

Gravel	**15.0 %**
Sand	**73.0 %**
%200 Sieve	**12.0 %**
N.Moisture	**5.1**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

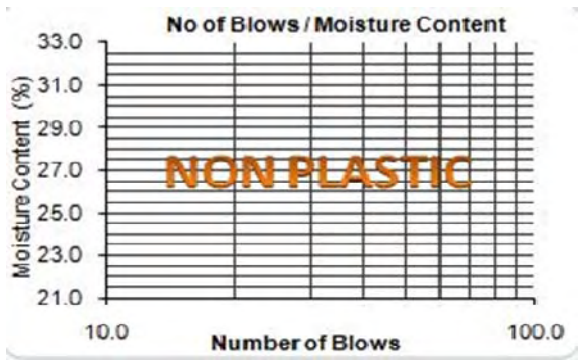
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD%	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

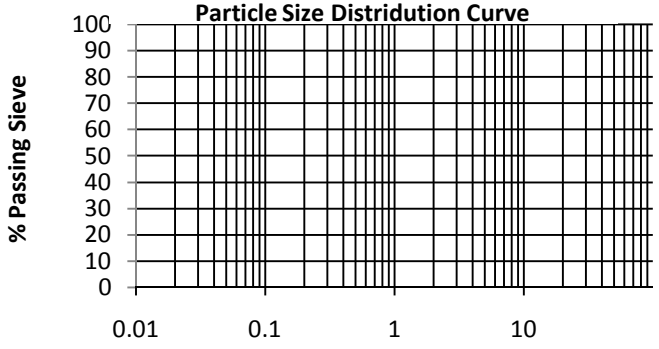
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 3		**Soil Description.**	Boulder			
Test Pit No.	TP # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	2.25 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

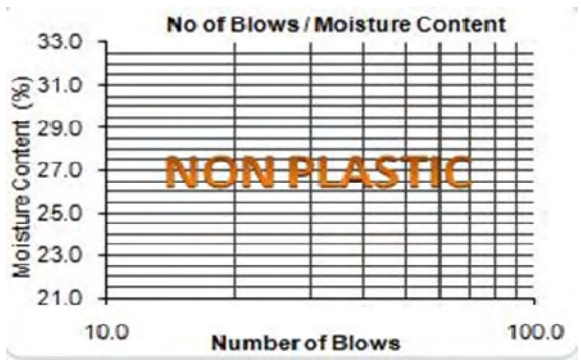
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

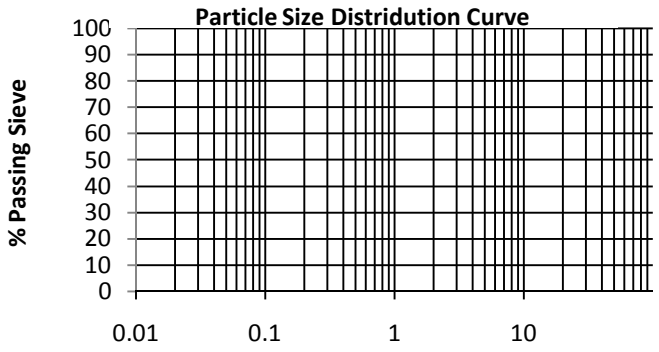
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 3		**Soil Description.**	Boulder			
Test Pit No.	TP # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

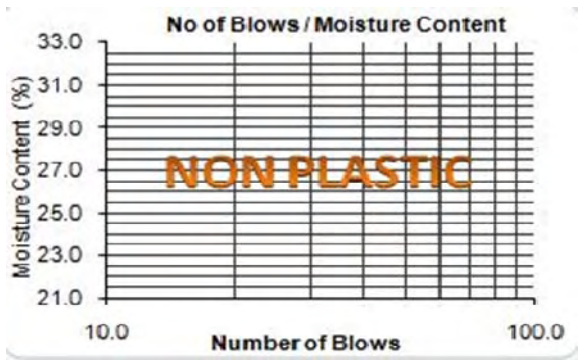
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

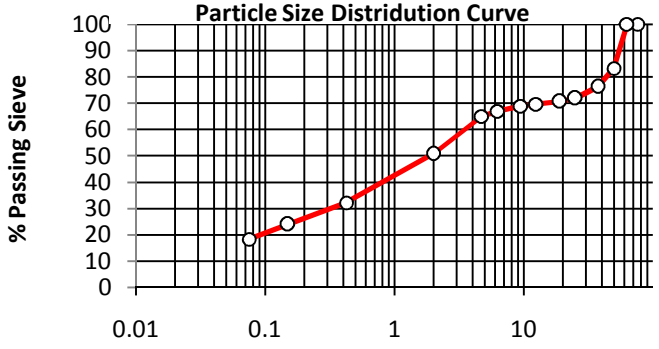
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 4		**Soil Description.**	Silty Sand with gravel			
Test Pit No.	TP # 4	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	0.75 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	3910.0
B	Wt. of Dry Sample After Washing	g	3484.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	426.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	10.9
E	Natural Moisture Content	%	4.2

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	655	16.8	83.2	83	
1 1/2	37.5	927	23.7	76.3	76	
1	25	1097	28.1	71.9	72	
3/4	19	1143	29.2	70.8	71	
1/2	12.5	1187	30.4	69.6	70	
3/8	9.5	1217	31.1	68.9	69	
1/4	6.3	1291	33.0	67.0	67	
# 4	4.75	1366	34.9	65.1	65	
# 10	2.00	1924	49.2	50.8	51	
# 40	0.425	2652	67.8	32.2	32	
# 100	0.150	2972	76.0	24.0	24	
# 200	0.075	3195	81.7	18.3	18	



Summary of S,Analysis

Gravel	**35.0 %**
Sand	**47.0 %**
%200 Sieve	**18.0 %**
N.Moisture	**4.2**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

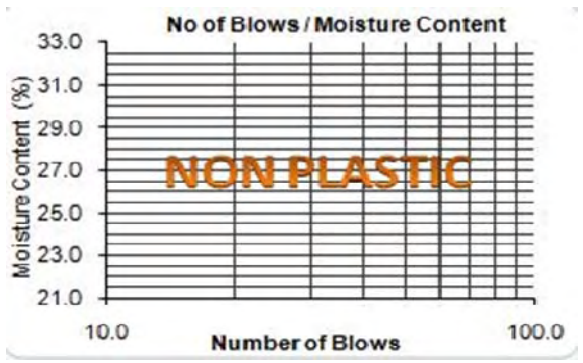
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

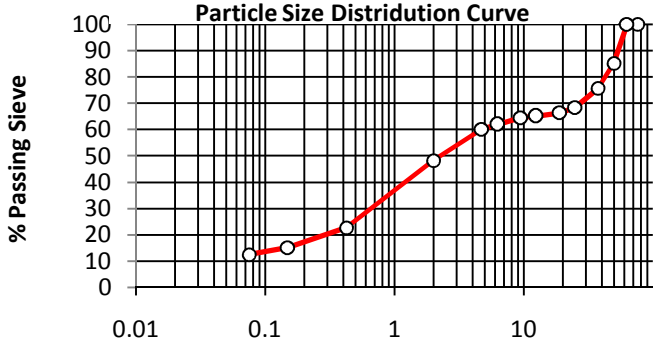
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 4		**Soil Description.**	Silty Sand with gravel			
Test Pit No.	TP # 4	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	1.50 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	3565.9
B	Wt. of Dry Sample After Washing	g	3356.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	209.9
D	%tage of Mat'ls Passing 75µm (no. 200)	g	5.9
E	Natural Moisture Content	%	4.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	526	14.8	85.2	85	
1 1/2	37.5	868	24.3	75.7	76	
1	25	1125	31.5	68.5	68	
3/4	19	1198	33.6	66.4	66	
1/2	12.5	1245	34.9	65.1	65	
3/8	9.5	1265	35.5	64.5	65	
1/4	6.3	1356	38.0	62.0	62	
# 4	4.75	1422	39.9	60.1	60	
# 10	2.00	1845	51.7	48.3	48	
# 40	0.425	2756	77.3	22.7	23	
# 100	0.150	3024	84.8	15.2	15	
# 200	0.075	3118	87.4	12.6	13	



Summary of S,Analysis

Gravel	**40.0 %**
Sand	**47.0 %**
%200 Sieve	**13.0 %**
N.Moisture	**4.9**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

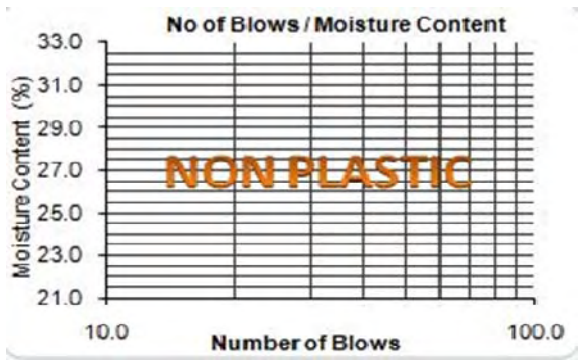
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
ShawalGeotechnical Engineering /Materials Testing Laboratory

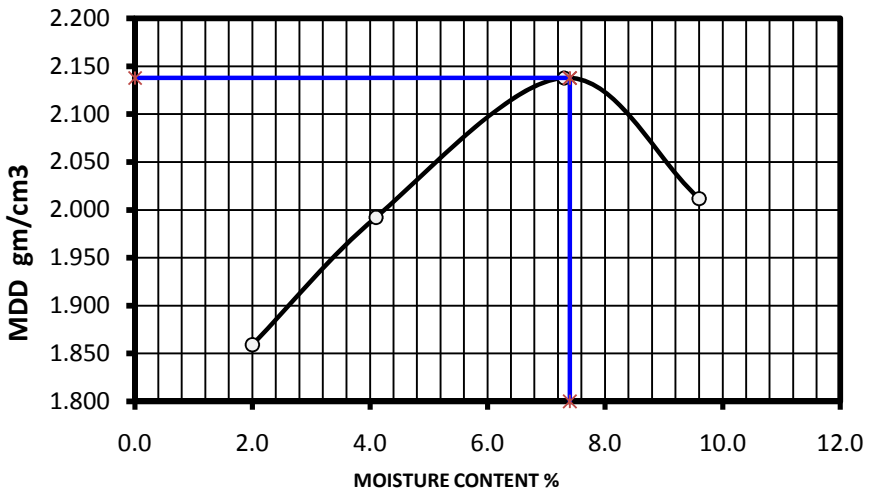
ASTM D-1557 Laboratory Compaction Characteristics of Soil Using Modified Effort – Proctor

Client.	**USAID**			**Job No.**	Scl -5
Project	**Geotechnical Explorationn for Salang Tunnel Substation**			**Testing Date.**	11/15/2013
Contractor	**TETRA TECH**			**Sampled by.**	Shawal
Contract No.	**KSC-229**			**Witnessed by.**	Contractor Rep.
Location	**Test Pit No # 4**	**Depth(m)**	**0.75 M**		

Line	Proctor		1	2	3	4	5	6
A	Mass of Mould, Base & Specimen	gm	10400	10777	11246	11057		
B	Mass of Mould & Base plate	gm	6370	6370	6370	6370		
C	Mass of Specimen, (A - B)	gm	4030	4407	4876	4687		
D	**Wet Density,** *W1 =(A-B)/ volume*	gm/cm^3	**1.896**	**2.074**	**2.294**	**2.205**		

Line	Moisture Content Determination		1	2	3	4	5	6
E	Container No.	no	**C - 9**	**C - 4**	**C - 7**	**C - 12**		
F	Mass of Wet Soil & Container	g	284.6	566.4	279.5	297.5		
G	Mass of Dry Soil & Container	g	279.8	545.6	264.2	275.6		
H	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	4.8	20.8	15.3	21.9		
J	Mass of Dry Soil, (G -H)	g	239.2	507.0	210.0	228.1		
K	**Moisture Content,** *w =(I /J)x100*	**%**	**2.0**	**4.1**	**7.3**	**9.6**		

Line	Dry Density of Soil		1	2	3	4	5	6
L	**Dry Density,** *W= [D/(K+100)]x100*	gm/cm^3	**1.859**	**1.992**	**2.138**	**2.012**		
M	**Dry Density,** *W= (L*62.43)*	PCF	**116.1**	**124.4**	**133.5**	**125.6**		



TEST METHOD	**ASTM D-1557**
DROP HEIGHT	**18in/457 mm**
COMPACTION TYPE	**Manual**
RAMMER WEIGHT	**4.54 Kg**
MOULD WEIGHT gm	**6370**
MOULD VOLUME gm/cm^3	**2125.4**
BLOWS/LAYER	**56**
(OMC)%	**7.4**
(MDD) gm/cm^3	**2.138**
(NMC)%	**4.1**

Lab Manager QC

Shawal GEMTL

Shawal Geotechnical Engineering /Materials Testing Laboratory

THE CALIFORNIA BEARING RATIO CBR TEST (ASTM D-1883)

Client.	USAID					**Date Sampled :**	11/10/2013
Project.	Geotechnical Explorationn for Salang Tunnel Substation					**Contractor.**	TETRA TECH
Material Source.	Test Pit No # 4	Depth of (M)	0.75 m				

Density Calculation of Mould

Blows	**10 Blows**	**30 Blows**	**65 Blows**
Mould No.	1	2	3
Mould+Samples (A)	11373.6	11714.6	11463.1
Mould (B)	6872.0	6957.0	6690.0
Sample (A-B)	4501.6	4757.6	4773.1
Cont. + Wet Sample	415.3	395.6	339.7
Cont. + Dry Sample	389.5	371.2	319.2
Wt of container	40.6	41.6	42.6
Wt of water	25.8	24.4	20.5
Wt of dry soil	348.9	329.6	276.6
Water Content %	**7.4**	**7.4**	**7.4**
Mould Volume	2108	2136	2052.0
Wet Density gm/cm^3	2.135	2.227	2.326
Dry Density gm/cm^3	**1.988**	**2.074**	**2.166**

Swell Record (mm)

Date	**Duration**	**10 Blows**	**30 Blows**	**65 Blows**
Initial		0.0	0.0	0.0
Final		0.0	0.00	0.00
Swelling %		0.00	0.00	0.00

Load/Penetration Record — *PLUNGER AREA cm^2* 19.354 — R.F = 4.24

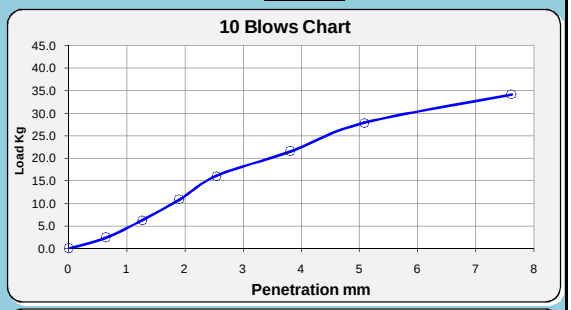
Std	**Penet.**	**10 Blows**		**30 Blows**		**65 Blows**	
Load	**mm**	**Readings**	**Load kg/cm^2**	**Readings**	**Load kg/cm^2**	**Readings**	**Load kg/cm^2**
	0.00	0.0	0.0	0.0	0.0	0.0	0.0
	0.64	11.0	2.41	21.2	4.6	28.2	6.2
	1.27	29.0	6.35	35.8	7.8	45.6	10.0
	1.91	50.0	10.95	73.5	16.1	85.2	18.7
70.3	**2.54**	73.6	**16.1**	92.5	**20.3**	105.2	**23.0**
	3.81	98.4	21.56	117.2	25.7	137.8	30.2
105.5	**5.08**	127.3	**27.9**	144.7	**31.7**	163.2	**35.8**
	7.62	156.0	34.18	184.8	40.5	215.3	47.2

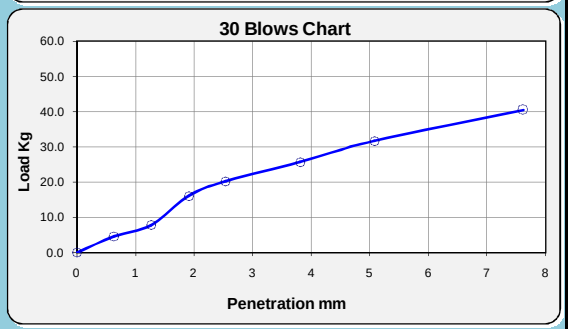
SUMMARY OF CBR TEST

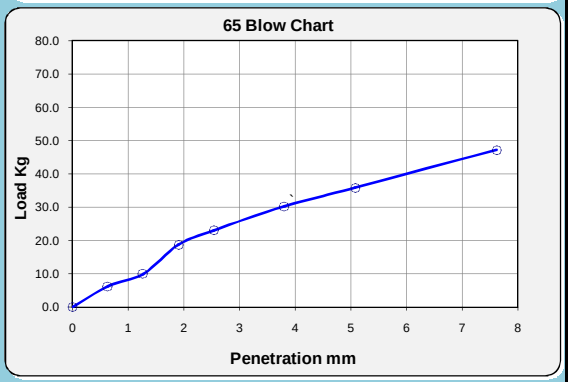
Tests Results	**10-Blows**	**30-Blows**	**65-Blows**
CBR % at 2.54$_{mm}$	**16.1**	**20.3**	**23.0**
CBR % at 5.08$_{mm}$	**27.9**	**31.7**	**35.8**
Correct CBR%@2.54mm	**22.9**	**28.8**	**32.8**
Compaction Rate %			
MDD (g/cm^3) (-)19mm	2.138		
OMC %	7.4		
ADJUSTED MDD(g/cm3			

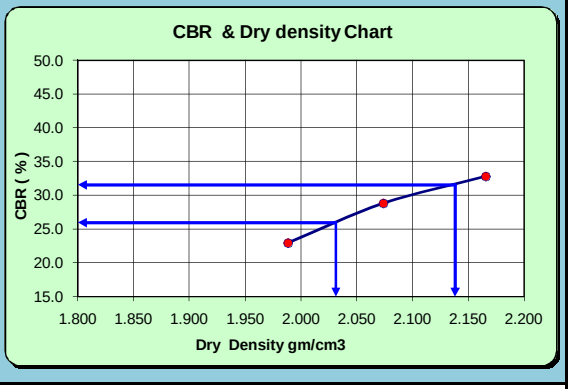
		CBR %
CBR @ 95 % Dry density	**2.031 gm/cm3**	**26.0 %**
CBR @ 100% Dry density	**2.138 gm/cm3**	**31.6 %**

Graphics:









Lab Manager QC

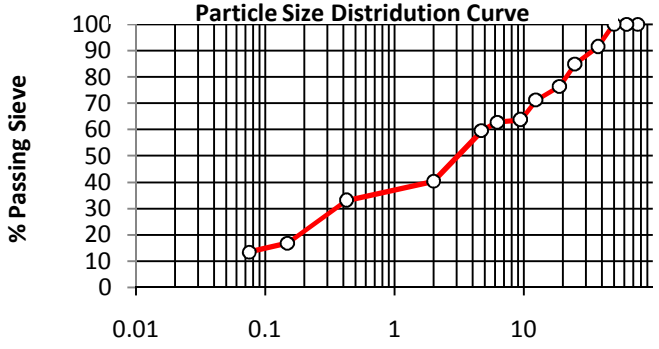
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 4		**Soil Description.**	Silty Sand with gravel			
Test Pit No.	TP # 4	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	2.25 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2966.0
B	Wt. of Dry Sample After Washing	g	2711.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	255.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	8.6
E	Natural Moisture Content	%	5.6

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	256	8.6	91.4	91	
1	25	446	15.0	85.0	85	
3/4	19	697	23.5	76.5	77	
1/2	12.5	852	28.7	71.3	71	
3/8	9.5	1078	36.3	63.7	64	
1/4	6.3	1101	37.1	62.9	63	
# 4	4.75	1198	40.4	59.6	60	
# 10	2.00	1768	59.6	40.4	40	
# 40	0.425	1987	67.0	33.0	33	
# 100	0.150	2465	83.1	16.9	17	
# 200	0.075	2567	86.5	13.5	13	



Summary of S,Analysis

Gravel	**40.0 %**
Sand	**47.0 %**
%200 Sieve	**13.0 %**
N.Moisture	**5.6**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

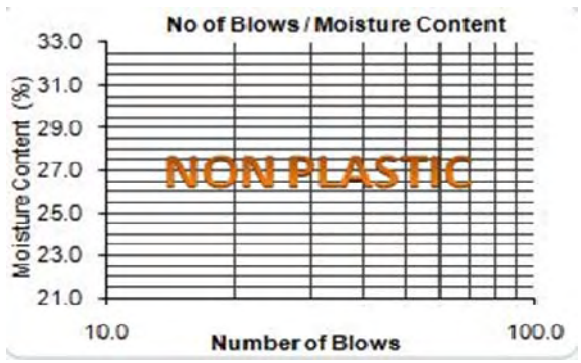
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

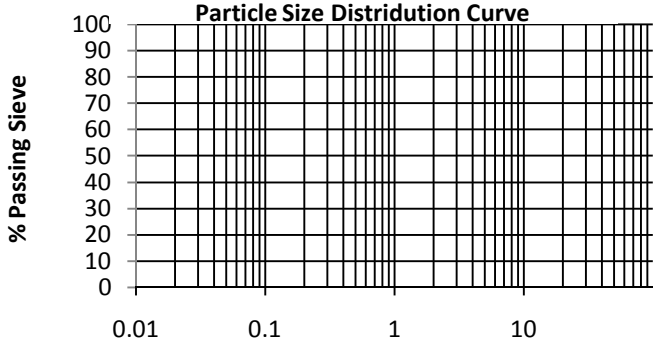
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 4		**Soil Description.**	Boulder			
Test Pit No.	TP # 4	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

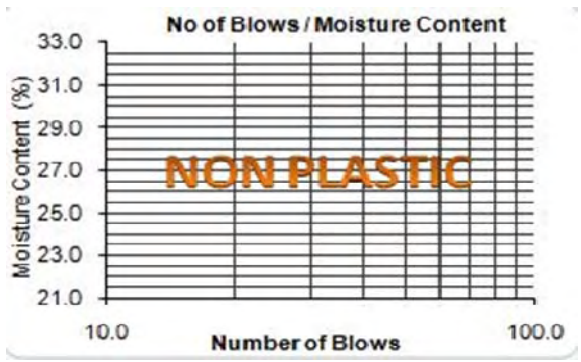
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

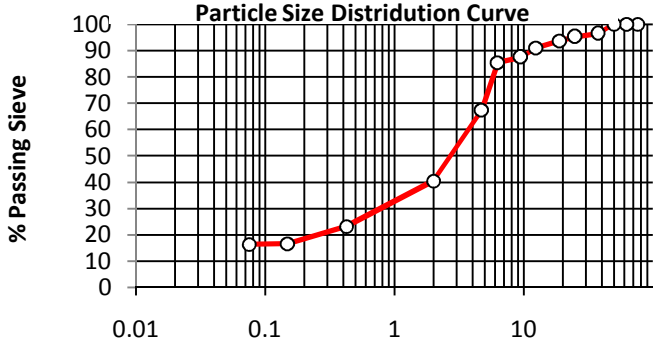
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 5	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 5 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2885.0
B	Wt. of Dry Sample After Washing	g	2420.3
C	Wt. of Mat'ls Loss During Washing (A - B)	g	464.7
D	%tage of Mat'ls Passing 75µm (no. 200)	g	16.1
E	Natural Moisture Content	%	3.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	102.3	3.5	96.5	96	
1	25	137.2	4.8	95.2	95	
3/4	19	181.6	6.3	93.7	94	
1/2	12.5	258.9	9.0	91.0	91	
3/8	9.5	360.2	12.5	87.5	88	
1/4	6.3	420.6	14.6	85.4	85	
# 4	4.75	938.9	32.5	67.5	67	
# 10	2.00	1716.5	59.5	40.5	41	
# 40	0.425	2215.3	76.8	23.2	23	
# 100	0.150	2404.8	83.4	16.6	17	
# 200	0.075	2412.7	83.6	16.4	16	



Summary of S,Analysis

Gravel	33.0 %
Sand	51.0 %
%200 Sieve	16.0 %
N.Moisture	3.9

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

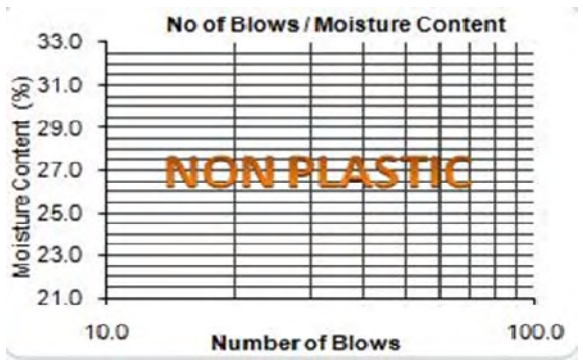
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			4 D	2 D	3 D	4 D
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			4 D	4 D	Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

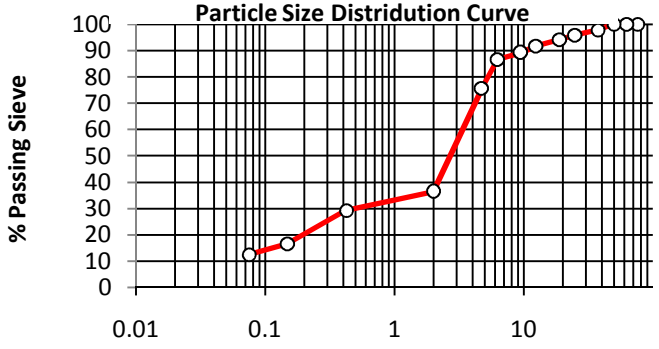
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 5	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 5 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2986.0
B	Wt. of Dry Sample After Washing	g	2781.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	205.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	6.9
E	Natural Moisture Content	%	4.5

Sieve Size		Weigth	% fo retained	% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)		Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	65.6	2.2	97.8	98	
1	25	120.7	4.0	96.0	96	
3/4	19	172.8	5.8	94.2	94	
1/2	12.5	245.1	8.2	91.8	92	
3/8	9.5	322.8	10.8	89.2	89	
1/4	6.3	399.8	13.4	86.6	87	
# 4	4.75	726.9	24.3	75.7	76	
# 10	2.00	1897.2	63.5	36.5	36	
# 40	0.425	2111.6	70.7	29.3	29	
# 100	0.150	2488.9	83.4	16.6	17	
# 200	0.075	2613.7	87.5	12.5	12	



Summary of S,Analysis

Gravel	24.0 %
Sand	64.0 %
%200 Sieve	12.0 %
N.Moisture	4.5

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

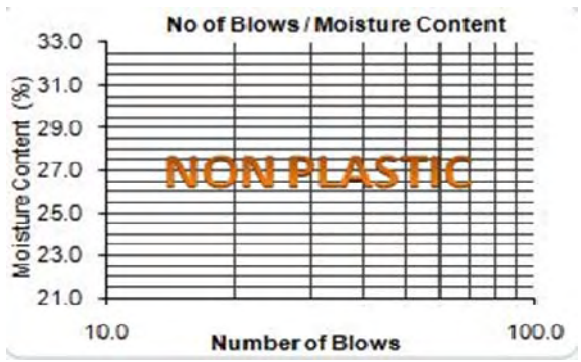
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			4 D	2 D	3 D	4 D
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			4 D	4 D	Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

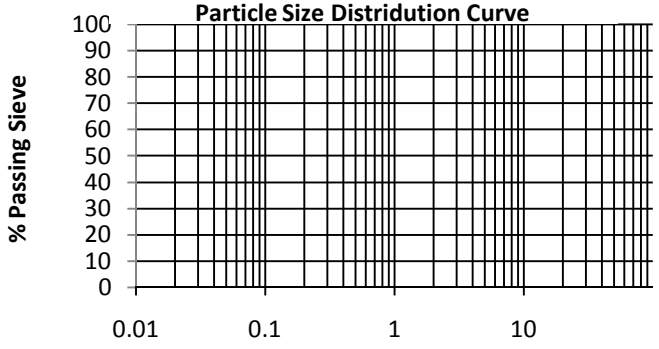
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 5	**Soil Descoription.**	Boulder		
Test Pit No.	TP # 5 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

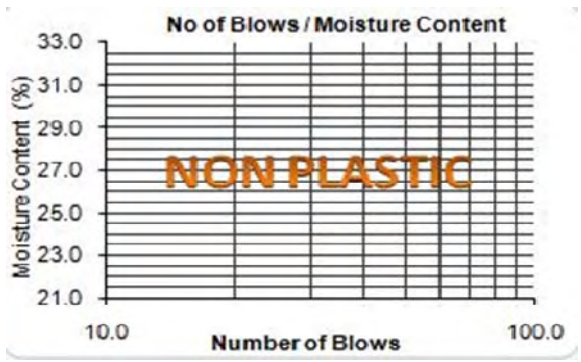
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

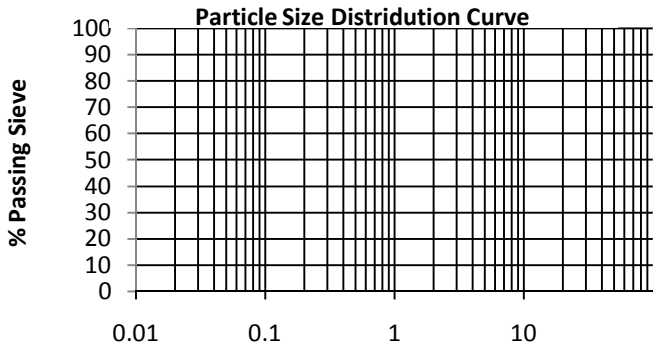
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 5	**Soil Descoription.**	Boulder		
Test Pit No.	TP # 5 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	3.00 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

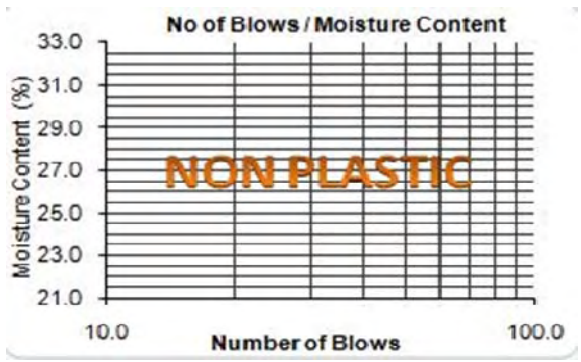
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

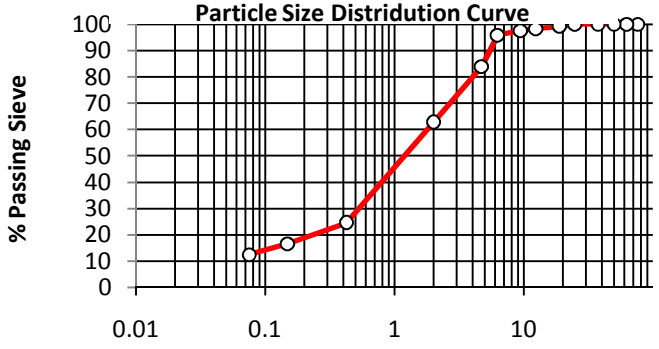
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 6		**Soil Description.**	Silty Sand with gravel			
Test Pit No.	TP # 6	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	0.75 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2261.0
B	Wt. of Dry Sample After Washing	g	2091.4
C	Wt. of Mat'ls Loss During Washing (A - B)	g	169.6
D	%tage of Mat'ls Passing 75µm (no. 200)	g	7.5
E	Natural Moisture Content	%	3.7

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	19.3	0.9	99.1	99	
1/2	12.5	37.2	1.6	98.4	98	
3/8	9.5	55.5	2.5	97.5	98	
1/4	6.3	93.7	4.1	95.9	96	
# 4	4.75	361.3	16.0	84.0	84	
# 10	2.00	842.6	37.3	62.7	63	
# 40	0.425	1706.2	75.5	24.5	25	
# 100	0.150	1885.4	83.4	16.6	17	
# 200	0.075	1978.2	87.5	12.5	13	



Summary of S,Analysis

Gravel	16.0 %
Sand	71.0 %
%200 Sieve	13.0 %
N.Moisture	3.7

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

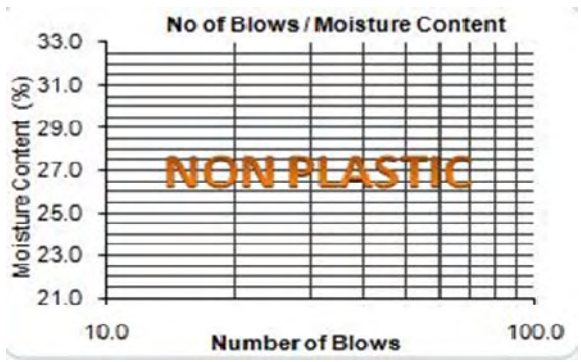
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

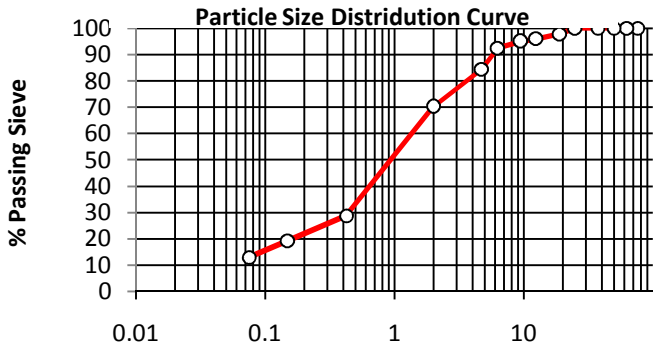
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 6	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 6 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2546.5
B	Wt. of Dry Sample After Washing	g	2341.1
C	Wt. of Mat'ls Loss During Washing (A - B)	g	205.4
D	%tage of Mat'ls Passing 75µm (no. 200)	g	8.1
E	Natural Moisture Content	%	4.5

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	0	0.0	100.0	100	
3/4	19	56.2	2.2	97.8	98	
1/2	12.5	99.8	3.9	96.1	96	
3/8	9.5	125.6	4.9	95.1	95	
1/4	6.3	189.7	7.4	92.6	93	
# 4	4.75	396.6	15.6	84.4	84	
# 10	2.00	756.6	29.7	70.3	70	
# 40	0.425	1813.7	71.2	28.8	29	
# 100	0.150	2054.6	80.7	19.3	19	
# 200	0.075	2215.9	87.0	13.0	13	



Summary of S,Analysis

Gravel	**16.0 %**
Sand	**71.0 %**
%200 Sieve	**13.0 %**
N.Moisture	**4.5**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

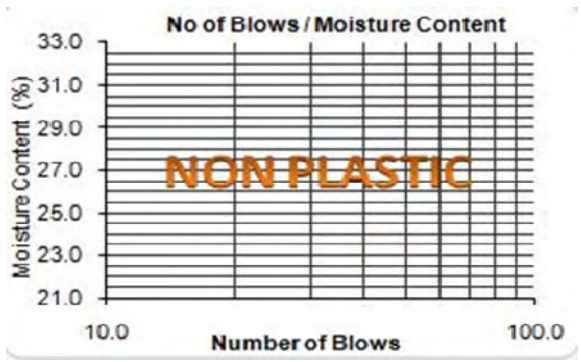
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

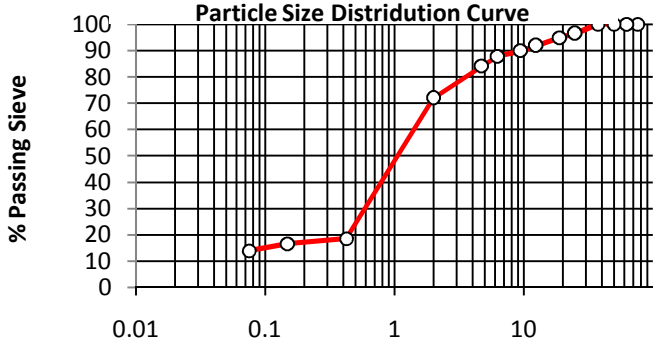
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 6	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 6 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2455.2
B	Wt. of Dry Sample After Washing	g	2288.4
C	Wt. of Mat'ls Loss During Washing (A - B)	g	166.8
D	%tage of Mat'ls Passing 75µm (no. 200)	g	6.8
E	Natural Moisture Content	%	5.1

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	85.7	3.5	96.5	97	
3/4	19	124.6	5.1	94.9	95	
1/2	12.5	199.8	8.1	91.9	92	
3/8	9.5	245.6	10.0	90.0	90	
1/4	6.3	298.6	12.2	87.8	88	
# 4	4.75	388.9	15.8	84.2	84	
# 10	2.00	689.7	28.1	71.9	72	
# 40	0.425	1999.5	81.4	18.6	19	
# 100	0.150	2045.6	83.3	16.7	17	
# 200	0.075	2112.2	86.0	14.0	14	



Summary of S,Analysis

Gravel	**16.0 %**
Sand	**70.0 %**
%200 Sieve	**14.0 %**
N.Moisture	**5.1**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

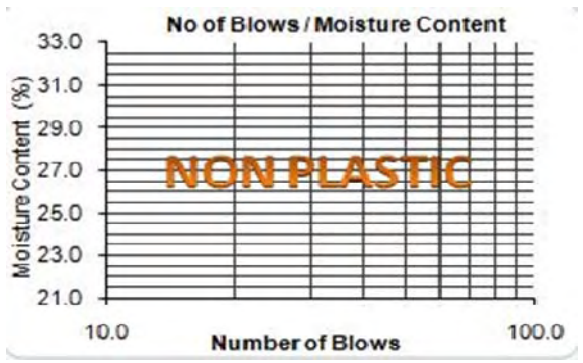
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD%	
% EXPANSION / CONSOLIDATION	

Lab.Manager

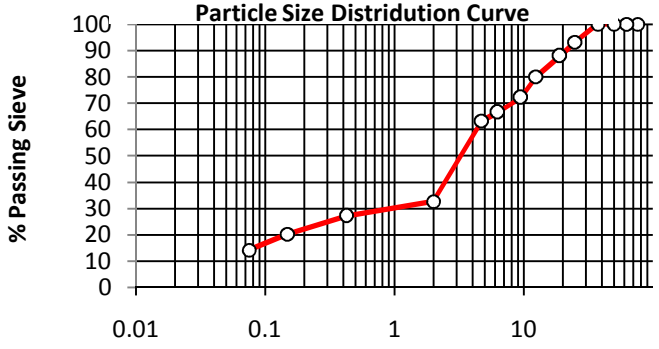
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 6		**Soil Description.**	Silty Sand with gravel			
Test Pit No.	TP # 6	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2966.3
B	Wt. of Dry Sample After Washing	g	2715.8
C	Wt. of Mat'ls Loss During Washing (A - B)	g	250.5
D	%tage of Mat'ls Passing 75µm (no. 200)	g	8.4
E	Natural Moisture Content	%	5.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	199.8	6.7	93.3	93	
3/4	19	357.6	12.1	87.9	88	
1/2	12.5	589.7	19.9	80.1	80	
3/8	9.5	825.6	27.8	72.2	72	
1/4	6.3	989.7	33.4	66.6	67	
# 4	4.75	1089.7	36.7	63.3	63	
# 10	2.00	1998.4	67.4	32.6	33	
# 40	0.425	2158.9	72.8	27.2	27	
# 100	0.150	2364.8	79.7	20.3	20	
# 200	0.075	2545.3	85.8	14.2	14	



Summary of S,Analysis

Gravel	**37.0 %**
Sand	**49.0 %**
%200 Sieve	**14.0 %**
N.Moisture	**5.9**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

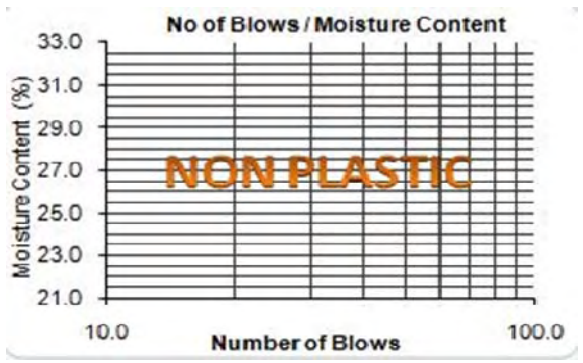
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD%	
% EXPANSION / CONSOLIDATION	

Lab.Manager

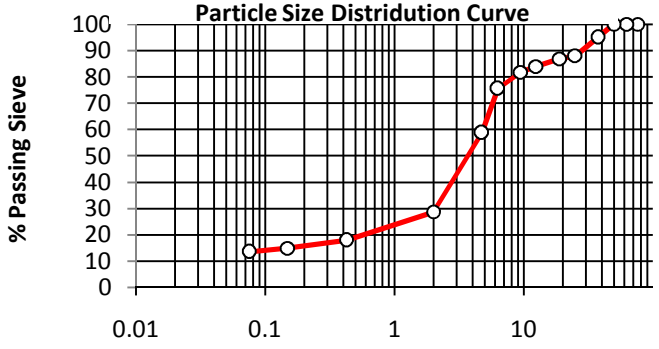
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 7	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 7 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2343.0
B	Wt. of Dry Sample After Washing	g	2050.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	293.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	12.5
E	Natural Moisture Content	%	3.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	116	5.0	95.0	95	
1	25	280	12.0	88.0	88	
3/4	19	308	13.1	86.9	87	
1/2	12.5	376	16.0	84.0	84	
3/8	9.5	426	18.2	81.8	82	
1/4	6.3	571	24.4	75.6	76	
# 4	4.75	965	41.2	58.8	59	
# 10	2.00	1670	71.3	28.7	29	
# 40	0.425	1921	82.0	18.0	18	
# 100	0.150	1994	85.1	14.9	15	
# 200	0.075	2025	86.4	13.6	14	



Summary of S,Analysis

Gravel	**41.0 %**
Sand	**45.0 %**
%200 Sieve	**14.0 %**
N.Moisture	**3.9**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

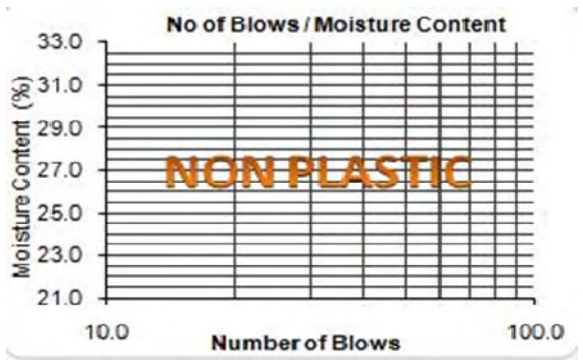
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
ShawalGeotechnical Engineering /Materials Testing Laboratory

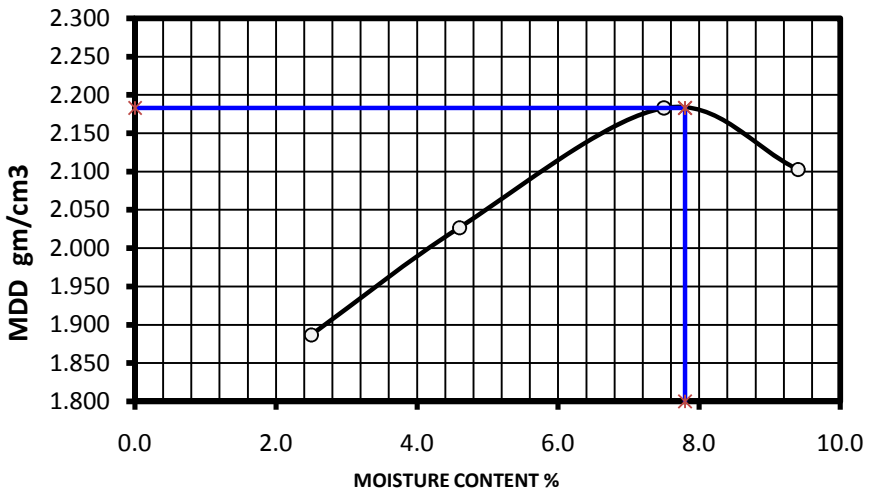
ASTM D-1557 Laboratory Compaction Characteristics of Soil Using Modified Effort – Proctor

Client.	**USAID**	**Job No.**	Scl -7
Project	**Geotechnical Explorationn for Salang Tunnel Substation**	**Testing Date.**	15/10/2013
Contractor	**TETRA TECH**	**Sampled by.**	Shawal
Contract No.	**KSC-229**	**Witnessed by.**	Contractor Rep.
Location	**Test Pit No # 7**	**Depth(m)**	**0.75 M**

Line	**Proctor**		**1**	**2**	**3**	**4**		
A	Mass of Mould, Base & Specimen	gm	10493	10888	11368	11271		
B	#REF!	gm	6387	6387	6387	6387		
C	#REF!	gm	4106	4501	4981	4884		
D	**Wet Density,** *W1 =(A-B)/ volume*	gm/cm^3	**1.934**	**2.120**	**2.347**	**2.301**		

Line	**Moisture Content Determination**		**1**	**2**	**3**	**4**		
E	Container No.	no	**C - 9**	**C - 4**	**C - 7**	**C - 12**		
F	Mass of Wet Soil & Container	g	278.6	255.8	297.5	228.5		
G	Mass of Dry Soil & Container	g	272.8	246.2	280.5	212.9		
H	Mass of Container	g	40.6	38.6	54.2	47.5		
I	Mass of Moisture, (F - G)	g	5.8	9.6	17.0	15.6		
J	Mass of Dry Soil, (G -H)	g	232.2	207.6	226.3	165.4		
K	**Moisture Content,** *w =(I /J)x100*	**%**	**2.5**	**4.6**	**7.5**	**9.4**		

Line	**Dry Density of Soil**		**1**	**2**	**3**	**4**		**6**
L	**Dry Density,** *W= [D/(K+100)]x100*	gm/cm^3	**1.887**	**2.027**	**2.183**	**2.103**		
M	**Dry Density,** *W= (L*62.43)*	PCF	**117.8**	**126.5**	**136.3**	**131.3**		



TEST METHOD	**ASTM D-1557**
DROP HEIGHT	**18in/457 mm**
COMPACTION TYPE	**Manual**
RAMMER WEIGHT	**4.54 Kg**
MOULD WEIGHT gm	**6387**
MOULD VOLUME gm/cm^3	**2122.7**
BLOWS/LAYER	**56**
(OMC)%	**7.8**
(MDD) gm/cm^3	**2.183**
(NMC)%	**4.3**

Lab Manager QC

Shawal GEMTL

Shawal Geotechnical Engineering /Materials Testing Laboratory

THE CALIFORNIA BEARING RATIO CBR TEST (ASTM D-1883)

Client.	USAID				**Date Sampled :**	11/10/2013
Project.	Geotechnical Explorationn for Salang Tunnel Substation				**Contractor.**	TETRA TECH
Material Source.	Test Pit No # 7	Depth of (M)	0.75 m			

Density Calculation of Mould

Blows	**10 Blows**	**30 Blows**	**65 Blows**
Mould No.	1	2	3
Mould+Samples (A)	11485.5	11832.8	11581.7
Mould (B)	6872.0	6957.0	6690.0
Sample (A-B)	4613.5	4875.8	4891.7
Cont. + Wet Sample	402.6	294.6	345.6
Cont. + Dry Sample	376.4	276.3	323.7
Wt of container	40.6	41.6	42.6
Wt of water	26.2	18.3	21.9
Wt of dry soil	335.8	234.7	281.1
Water Content %	**7.8**	**7.8**	**7.8**
Mould Volume	2108	2136	2052.0
Wet Density gm/cm^3	2.189	2.283	2.384
Dry Density gm/cm^3	**2.030**	**2.118**	**2.211**

Swell Record (mm)

Date	**Duration**	**10 Blows**	**30 Blows**	**65 Blows**
Initial		0.0	0.0	0.0
Final		0.0	0.00	0.00
Swelling %		0.00	0.00	0.00

Load/Penetration Record

PLUNGER AREA cm^2 **19.354** — **R.F = 4.24**

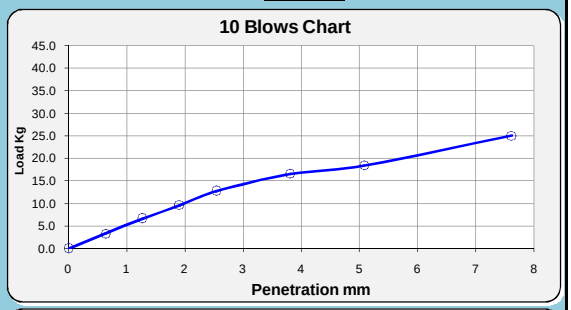
Std Load	**Penet. mm**	**10 Blows Readings**	**10 Blows Load kg/cm^2**	**30 Blows Readings**	**30 Blows Load kg/cm^2**	**65 Blows Readings**	**65 Blows Load kg/cm^2**
	0.00	0.0	0.0	0.0	0.0	0.0	0.0
	0.64	15.3	3.35	22.2	4.9	25.2	5.5
	1.27	30.4	6.66	39.5	8.7	51.7	11.3
	1.91	44.1	9.66	60.3	13.2	73.6	16.1
70.3	**2.54**	58.3	**12.8**	81.2	**17.8**	103.6	**22.7**
	3.81	75.9	16.63	92.8	20.3	138.6	30.4
105.5	**5.08**	84.2	**18.4**	108.2	**23.7**	165.3	**36.2**
	7.62	114.3	25.04	131.5	28.8	201.4	44.1

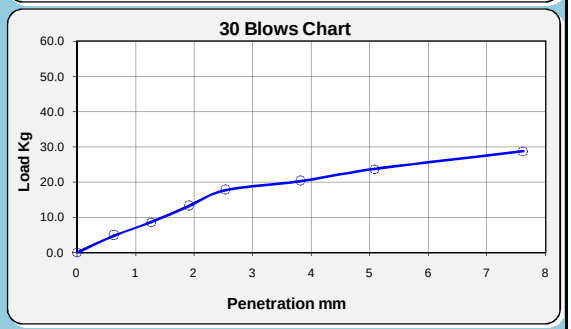
SUMMARY OF CBR TEST

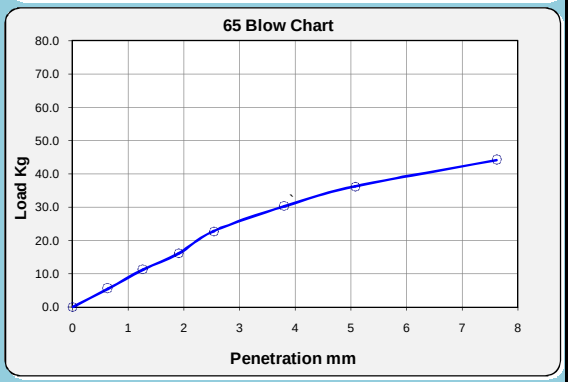
Tests Results	**10-Blows**	**30-Blows**	**65-Blows**
CBR % at 2.54$_{mm}$	**12.8**	**17.8**	**22.7**
CBR % at 5.08$_{mm}$	**18.4**	**23.7**	**36.2**
Correct CBR%@2.54mm	**18.2**	**25.3**	**32.3**
Compaction Rate %			
MDD (g/cm^3) (-)19mm	2.183		
OMC %	7.8		
ADJUSTED MDD(g/cm3			

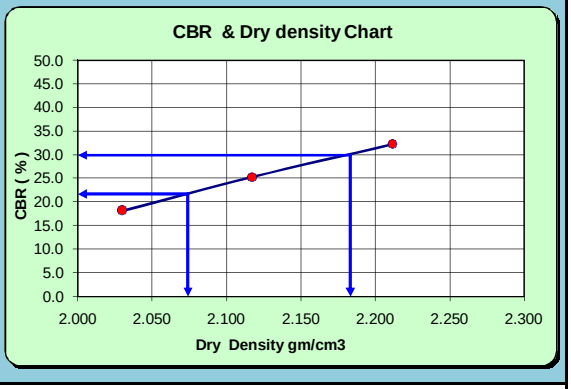
		CBR %
CBR @ 95 % Dry density	**2.074 gm/cm3**	**21.8 %**
CBR @ 100% Dry density	**2.183 gm/cm3**	**30.0 %**

Graphics:









Lab Manager QC

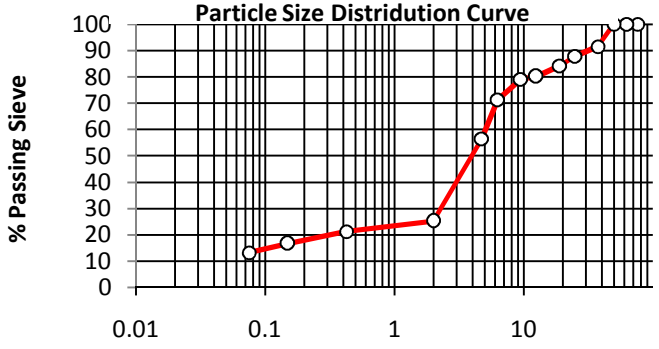
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 7	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 7 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2516.2
B	Wt. of Dry Sample After Washing	g	2403.2
C	Wt. of Mat'ls Loss During Washing (A - B)	g	113.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	4.5
E	Natural Moisture Content	%	5.1

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	214.6	8.5	91.5	91	
1	25	305.6	12.1	87.9	88	
3/4	19	396.7	15.8	84.2	84	
1/2	12.5	497.5	19.8	80.2	80	
3/8	9.5	525.9	20.9	79.1	79	
1/4	6.3	721.4	28.7	71.3	71	
# 4	4.75	1094.5	43.5	56.5	57	
# 10	2.00	1879.5	74.7	25.3	25	
# 40	0.425	1982.4	78.8	21.2	21	
# 100	0.150	2094.1	83.2	16.8	17	
# 200	0.075	2184.5	86.8	13.2	13	



Summary of S,Analysis

Gravel	**43.0 %**
Sand	**44.0 %**
%200 Sieve	**13.0 %**
N.Moisture	**5.1**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

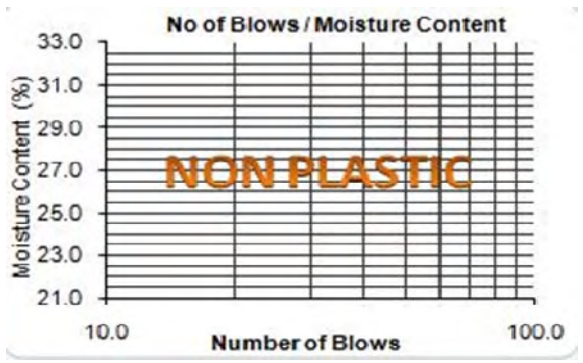
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			4 D	2 D	3 D	4 D
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			4 D	4 D	Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

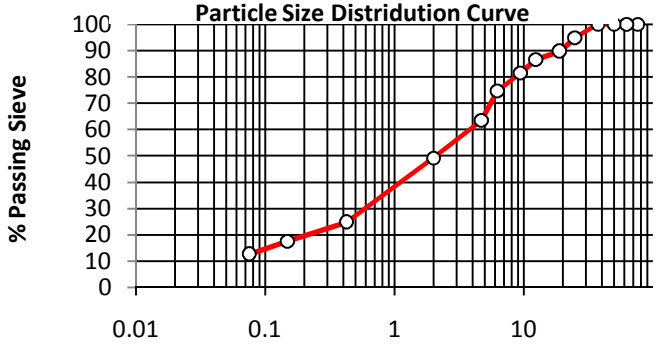
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 7	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 7 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2466.1
B	Wt. of Dry Sample After Washing	g	2210.7
C	Wt. of Mat'ls Loss During Washing (A - B)	g	255.4
D	%tage of Mat'ls Passing 75µm (no. 200)	g	10.4
E	Natural Moisture Content	%	5.6

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	125.4	5.1	94.9	95	
3/4	19	255.4	10.4	89.6	90	
1/2	12.5	327.9	13.3	86.7	87	
3/8	9.5	455.7	18.5	81.5	82	
1/4	6.3	623.4	25.3	74.7	75	
# 4	4.75	898.5	36.4	63.6	64	
# 10	2.00	1252.1	50.8	49.2	49	
# 40	0.425	1854.6	75.2	24.8	25	
# 100	0.150	2032.1	82.4	17.6	18	
# 200	0.075	2154.4	87.4	12.6	13	



Summary of S,Analysis

Gravel	**36.0 %**
Sand	**51.0 %**
%200 Sieve	**13.0 %**
N.Moisture	**5.6**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

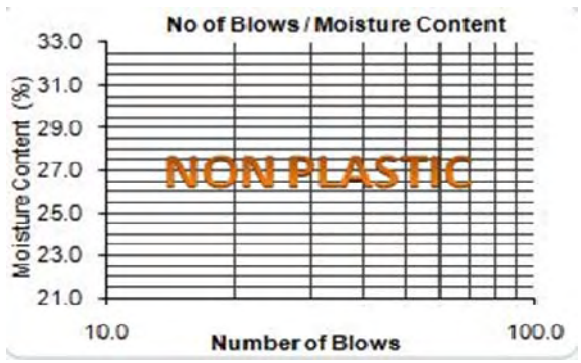
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

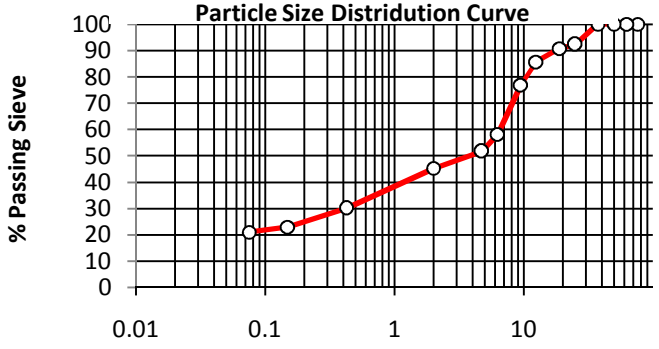
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 7	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 7 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	3.00 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2551.4
B	Wt. of Dry Sample After Washing	g	2133.9
C	Wt. of Mat'ls Loss During Washing (A - B)	g	417.5
D	%tage of Mat'ls Passing 75µm (no. 200)	g	16.4
E	Natural Moisture Content	%	6.9

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	194.6	7.6	92.4	92	
3/4	19	233.7	9.2	90.8	91	
1/2	12.5	365.9	14.3	85.7	86	
3/8	9.5	589.7	23.1	76.9	77	
1/4	6.3	1065.1	41.7	58.3	58	
# 4	4.75	1229.7	48.2	51.8	52	
# 10	2.00	1396.8	54.7	45.3	45	
# 40	0.425	1784.2	69.9	30.1	30	
# 100	0.150	1965.3	77.0	23.0	23	
# 200	0.075	2015.6	79.0	21.0	21	



Summary of S,Analysis

Gravel	**48.0 %**
Sand	**31.0 %**
%200 Sieve	**21.0 %**
N.Moisture	**6.9**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

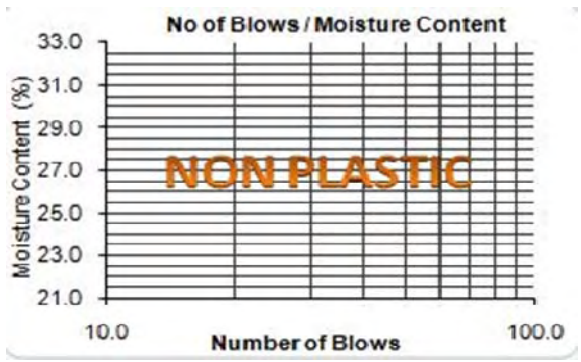
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

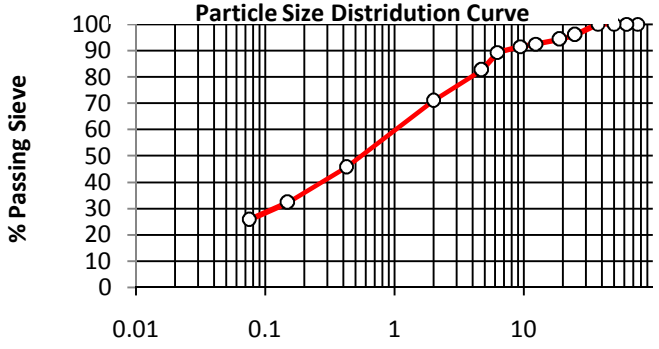
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 8	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 8 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2448.0
B	Wt. of Dry Sample After Washing	g	1824.4
C	Wt. of Mat'ls Loss During Washing (A - B)	g	623.6
D	%tage of Mat'ls Passing 75µm (no. 200)	g	25.5
E	Natural Moisture Content	%	2.6

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	0	0.0	100.0	100	
1	25	97.7	4.0	96.0	96	
3/4	19	139.4	5.7	94.3	94	
1/2	12.5	182.3	7.4	92.6	93	
3/8	9.5	206.6	8.4	91.6	92	
1/4	6.3	262.4	10.7	89.3	89	
# 4	4.75	424.1	17.3	82.7	83	
# 10	2.00	709.6	29.0	71.0	71	
# 40	0.425	1330.4	54.3	45.7	46	
# 100	0.150	1656.8	67.7	32.3	32	
# 200	0.075	1818.8	74.3	25.7	26	



Summary of S,Analysis

Gravel	17.0 %
Sand	57.0 %
%200 Sieve	26.0 %
N.Moisture	2.6

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

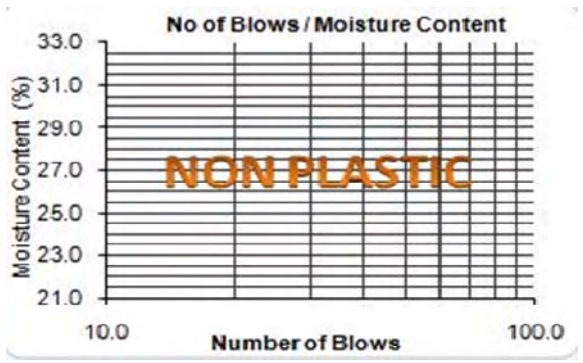
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

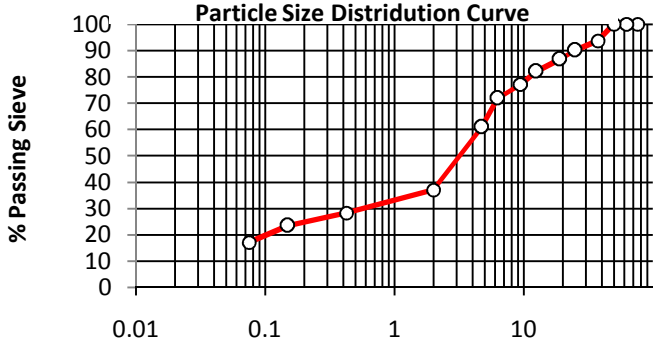
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 8	**Soil Description.**	Silty Sand with gravel		
Test Pit No.	TP # 8 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2613.7
B	Wt. of Dry Sample After Washing	g	2249.8
C	Wt. of Mat'ls Loss During Washing (A - B)	g	363.9
D	%tage of Mat'ls Passing 75µm (no. 200)	g	13.9
E	Natural Moisture Content	%	4.3

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	165.6	6.3	93.7	94	
1	25	256.7	9.8	90.2	90	
3/4	19	345.3	13.2	86.8	87	
1/2	12.5	466.7	17.9	82.1	82	
3/8	9.5	597.8	22.9	77.1	77	
1/4	6.3	734.1	28.1	71.9	72	
# 4	4.75	1019.7	39.0	61.0	61	
# 10	2.00	1645.2	62.9	37.1	37	
# 40	0.425	1873	71.7	28.3	28	
# 100	0.150	1998.7	76.5	23.5	24	
# 200	0.075	2165.8	82.9	17.1	17	



Summary of S,Analysis

Gravel	39.0 %
Sand	44.0 %
%200 Sieve	17.0 %
N.Moisture	4.3

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

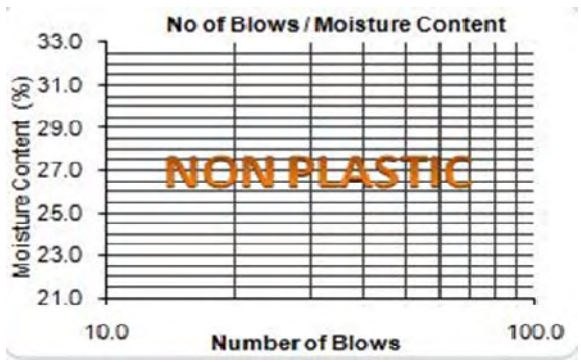
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

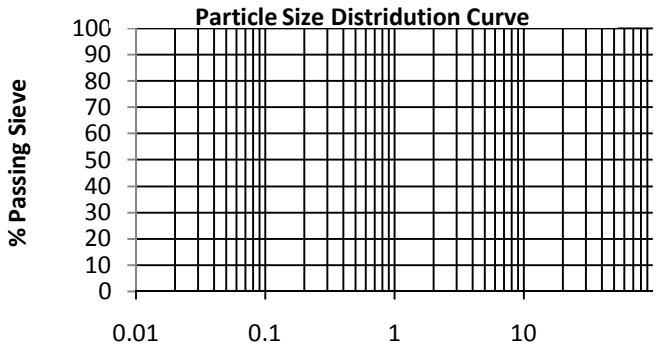
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Test Pit No # 8	**Soil Descoription.**	Boulder		
Test Pit No.	TP # 8 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

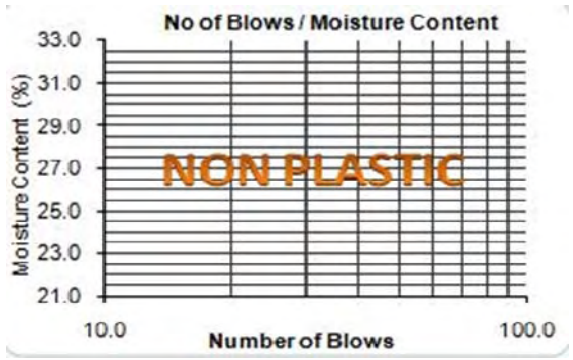
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

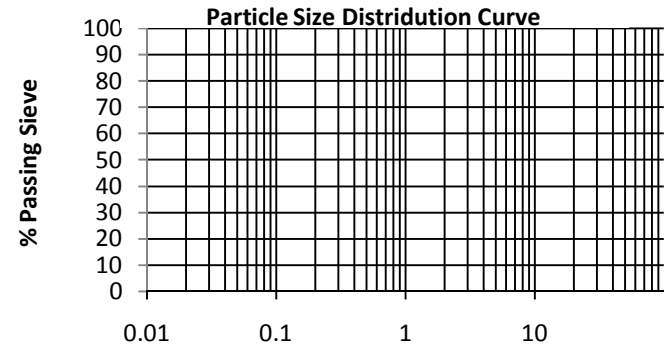
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/10/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Test Pit No # 8		**Soil Description.**	Boulder			
Test Pit No.	TP # 8	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

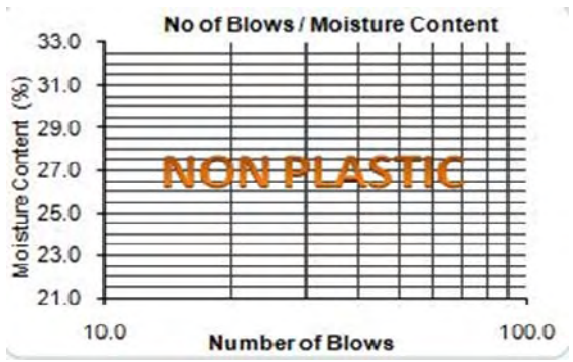
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	10/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
TP #	2	Depth(m)	1.5	Tested By	Hikmat

Horizontal Gage Shear Displacement	Sample No. 1				Sample No. 2				Sample No. 3			
	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000
25.0	0.09	0.22	1.25	0.012046	0.12	1.48	1.27	0.012236	0.13	2.78	2.31	0.022223
50.0	0.12	1.51	2.82	0.027149	0.15	2.71	2.26	0.021685	0.15	6.91	5.61	0.053953
75.0	0.14	4.71	5.38	0.051734	0.18	6.81	5.53	0.053185	0.18	10.01	8.09	0.077769
100.0	0.17	5.81	6.26	0.060185	0.20	9.61	7.77	0.074696	0.21	16.11	12.96	0.124634
125.0	0.18	7.01	7.22	0.069404	0.23	11.61	9.37	0.090061	0.23	21.21	17.04	0.163815
150.0	0.20	8.81	8.66	0.083233	0.24	15.71	12.64	0.121560	0.27	25.91	20.79	0.199924
175.0	0.22	9.71	9.38	0.090147	0.26	18.11	14.56	0.139999	0.31	31.11	24.95	0.239874
200.0	0.23	10.11	9.69	0.093220	0.28	20.61	16.56	0.159206	0.36	34.61	27.74	0.266763
250.0	0.25	12.11	11.29	0.108585	0.30	22.91	18.40	0.176876	0.41	38.71	31.02	0.298262
300.0	0.26	14.31	13.05	0.125487	0.32	25.71	20.63	0.198387	0.45	40.01	32.06	0.308250
400.0	0.28	14.61	13.29	0.127792	0.35	28.81	23.11	0.222204	0.52	44.11	35.33	0.339749
500.0	0.30	16.21	14.57	0.140085	0.37	29.91	23.99	0.230655	0.55	46.51	37.25	0.358187
600.0	0.30	16.21	14.57	0.140085	0.40	30.41	24.39	0.234496	0.57	48.21	38.61	0.371248
700.0	0.29	15.01	13.61	0.130865	0.40	30.41	24.39	0.234496	0.57	48.21	38.61	0.371248
800.0	0.28	14.81	13.45	0.129329	0.39	30.01	24.07	0.231423	0.56	46.81	37.49	0.360492
900.0	0.27	14.01	12.81	0.123183	0.39	29.61	23.75	0.228350	0.56	46.61	37.33	0.358956
1000.0	0.27	13.71	12.57	0.120878	0.38	29.01	23.27	0.223740	0.55	46.11	36.93	0.355114

Description of Soil (Class)	*ML*			*Strain Rate*	*0.5 mm/min*
Sample No.	*1*	*2*	*3*	*Type of Test*	*CD*
Normal Stress, kg/cm²	*0.244500*	*0.486900*	*0.734600*	*Proving Ring Calibration Factor*	*0.52 kg/Div*

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	10/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
TP #	2	Depth(m)	1.5	Description of Soil	ML

DIRECT SHEAR TEST (ASTM D3080)

Type of Test	CD		
Strain Rate	0.5 mm/min		
Sample No.	1	2	3
Normal Stress, kg/cm^2	0.244500	0.486900	0.734600

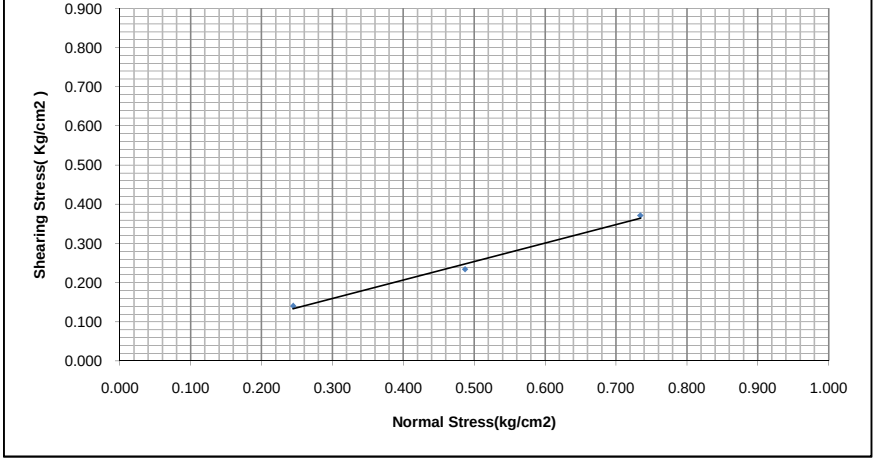
SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	10.2	10.2	10.2
Height	(cm)	2	2	2
Area	(cm^2)	104.04	104.04	104.04
Volume	(cm^3)	208.08	208.08	208.08
Weight of Soil + Split Former	(g)	488.4127101	489.5127101	488.1127101
Weight of Split Former	(g)	131.4	131.4	131.4
Weight of Soil	(g)	357.0127101	358.1127101	356.7127101
Wet Unit Weight	(kg/cm3)	1.715747357	1.721033786	1.714305604
Dry Unit Weight	(kg/cm3)	1.642023838	1.647519606	1.638382107

WATER CONTENT DETERMINATION

Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	124.9	138.7	142.6
Weight of Dry Soil + Container	(g)	120.9	134.3	137.8
Weight of Water	(g)	3.982	4.4	4.85
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	88.69	98.608	104.66
Water Content	(%)	4.49	4.46	4.63

Sample No.	Water Content %		Normal Stress kg/cm^2	Max. Shearing Stress kg/cm2
	before test	after test		
1	4.49	4.26	0.244500	0.140085
2	4.46	4.10	0.486900	0.228350
3	4.63	4.22	0.734600	0.360492



Cohesion, C =	1.86	Kpa

∅ Angle =	25.2°	Degree

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	11/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
TP #	8	Depth(m)	1.5	Tested By	Hikmat

Horizontal Gage Shear Displacement	Sample No. 1				Sample No. 2				Sample No. 3			
	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000
25.0	0.01	4.50	3.60	0.035599	0.03	6.10	4.87	0.048256	0.09	11.30	9.03	0.089393
50.0	0.03	5.80	4.63	0.045883	0.08	8.50	6.79	0.067243	0.13	16.20	12.94	0.128156
75.0	0.05	7.10	5.67	0.056167	0.11	10.60	8.47	0.083855	0.16	21.10	16.86	0.166920
100.0	0.08	10.40	8.31	0.082273	0.13	14.30	11.43	0.113126	0.20	26.30	21.01	0.208056
125.0	0.11	13.20	10.55	0.104424	0.15	18.40	14.70	0.145560	0.24	32.40	25.89	0.256313
150.0	0.15	15.20	12.14	0.120246	0.17	22.70	18.14	0.179577	0.27	37.60	30.04	0.297450
175.0	0.17	18.60	14.86	0.147143	0.19	24.20	19.34	0.191444	0.29	41.50	33.16	0.328302
200.0	0.19	20.60	16.46	0.162964	0.23	28.30	22.61	0.223878	0.33	47.30	37.79	0.374185
250.0	0.21	21.30	17.02	0.168502	0.26	30.20	24.13	0.238909	0.36	55.40	44.26	0.438263
300.0	0.23	22.10	17.66	0.174831	0.30	34.20	27.33	0.270552	0.38	60.50	48.34	0.478609
400.0	0.25	23.60	18.86	0.186697	0.33	38.20	30.52	0.302196	0.41	62.30	49.78	0.492849
500.0	0.25	23.60	18.86	0.186697	0.35	40.50	32.36	0.320391	0.43	65.30	52.17	0.516581
600.0	0.25	22.40	17.90	0.177204	0.35	40.20	32.12	0.318018	0.46	67.30	53.77	0.532403
700.0	0.24	22.00	17.58	0.174040	0.34	39.60	31.64	0.313271	0.46	67.30	53.77	0.532403
800.0	0.24	21.80	17.42	0.172457	0.34	39.10	31.24	0.309316	0.45	66.70	53.29	0.527656
900.0	0.23	21.30	17.02	0.168502	0.33	38.40	30.68	0.303778	0.45	66.10	52.81	0.522910
1000.0	0.22	20.50	16.38	0.162173	0.33	38.10	30.44	0.301405	0.44	65.50	52.33	0.518163

Description of Soil (Class)	*SM*			*Strain Rate*	*0.5 mm/min*
Sample No.	*1*	*2*	*3*	*Type of Test*	*CD*
Normal Stress, kg/cm²	*0.244500*	*0.486900*	*0.734600*	*Proving Ring Calibration Factor*	*0.52 kg/Div*

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	11/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
TP #	8	Depth(m)	1.5	Description of Soil	SM

DIRECT SHEAR TEST (ASTM D3080)

Type of Test	CD		
Strain Rate	0.5 mm/min		
Sample No.	1	2	3
Normal Stress, kg/cm^2	0.244500	0.486900	0.734600

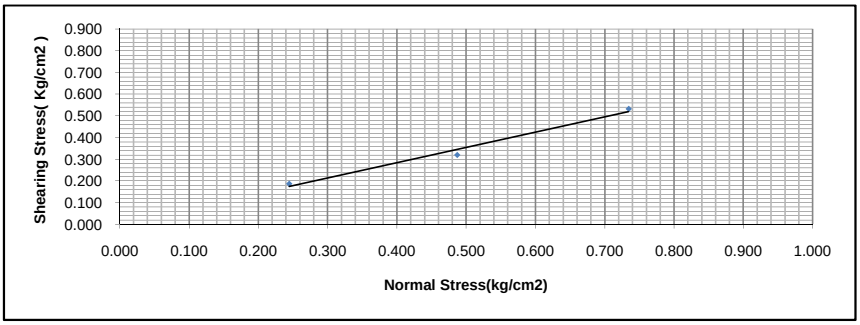
SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	9.99	9.99	9.99
Height	(cm)	2	2	2
Area	(cm^2)	99.8	99.8	99.8
Volume	(cm^3)	199.6	199.6	199.6
Weight of Soil + Split Former	(g)	464.5	466.0	463.3
Weight of Split Former	(g)	119	119	119
Weight of Soil	(g)	345.53	347.03	344.33
Wet Unit Weight	(kg/cm3)	1.73	1.74	1.73
Dry Unit Weight	(kg/cm3)	1.66	1.66	1.65

WATER CONTENT DETERMINATION

Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	122.2	136.2	139.7
Weight of Dry Soil + Container	(g)	118.3	131.8	135.2
Weight of Water	(g)	3.852	4.46	4.51
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	86.14	96.058	102.11
Water Content	(%)	4.47	4.64	4.42

Sample No.	Water Content %		Normal Stress kg/cm^2	Max. Shearing Stress kg/cm2
	before test	after test		
1	4.47	4.24	0.244500	0.186697
2	4.64	4.28	0.486900	0.320391
3	4.42	4.01	0.734600	0.532403



Cohesion, C =	0.000	Kg/cm2

∅ Angle =	33.4	Degree

Appendix F

Boreholes Laboratory Soil Test Results

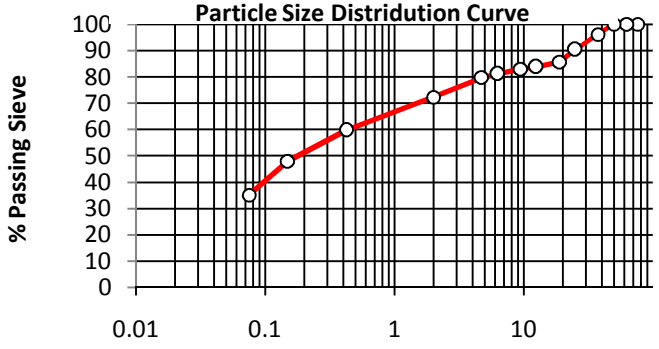
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 2		**Soil Description.**	Silty Sand with gravel			
Bore Hole	BH # 2	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	0.75 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2675.2
B	Wt. of Dry Sample After Washing	g	1436.4
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1238.8
D	%tage of Mat'ls Passing 75µm (no. 200)	g	46.3
E	Natural Moisture Content	%	4.3

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	103.5	3.9	96.1	96	
1	25	255.2	9.5	90.5	90	
3/4	19	382.1	14.3	85.7	86	
1/2	12.5	432.5	16.2	83.8	84	
3/8	9.5	455.9	17.0	83.0	83	
1/4	6.3	502.4	18.8	81.2	81	
# 4	4.75	540.8	20.2	79.8	80	
# 10	2.00	740.2	27.7	72.3	72	
# 40	0.425	1074.9	40.2	59.8	60	
# 100	0.150	1391.5	52.0	48.0	48	
# 200	0.075	1735.9	64.9	35.1	35	



Summary of S,Analysis

Gravel	**20.0 %**
Sand	**45.0 %**
%200 Sieve	**35.0 %**
N.Moisture	**4.3**

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

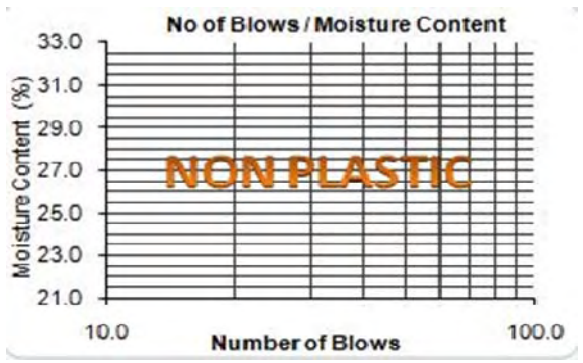
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

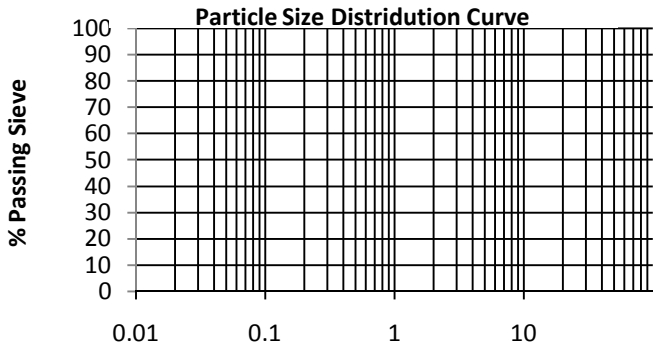
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Bore Hole No # 2	**Soil Description.**	Boulder		
Bore Hole	BH # 2 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

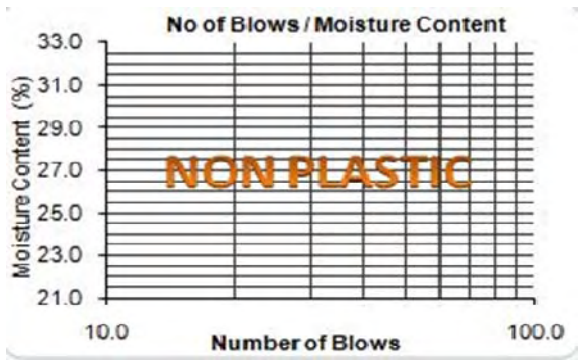
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

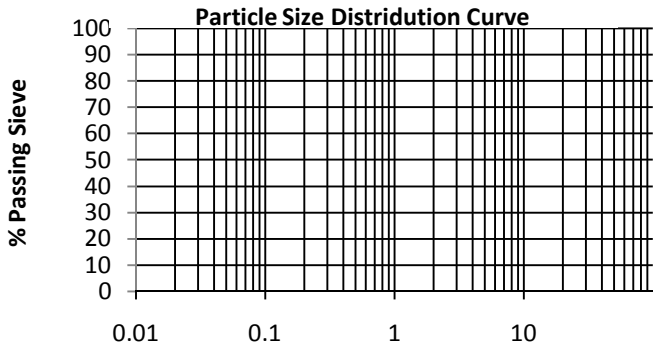
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 2		**Soil Description.**	Boulder			
Bore Hole	BH # 2	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	2.25 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	0.0 %
Sand	3.0 %
%200 Sieve	97.0 %
N.Moisture	6.3

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

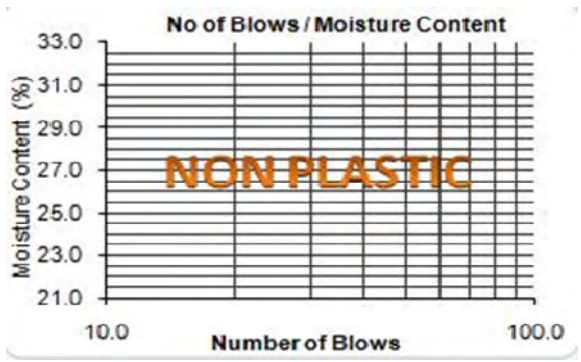
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			4 D	2 D	3 D	4 D
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			4 D	4 D	Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

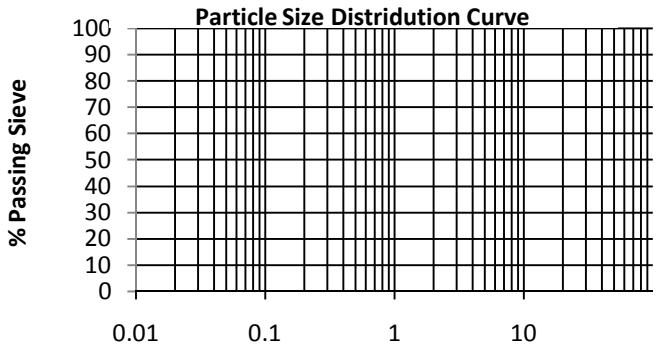
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 2		**Soil Description.**	Boulder			
Bore Hole	BH # 2	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

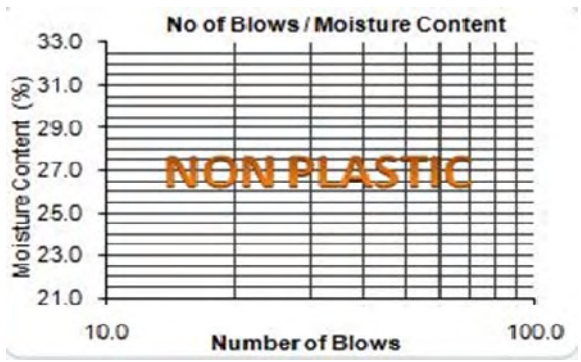
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

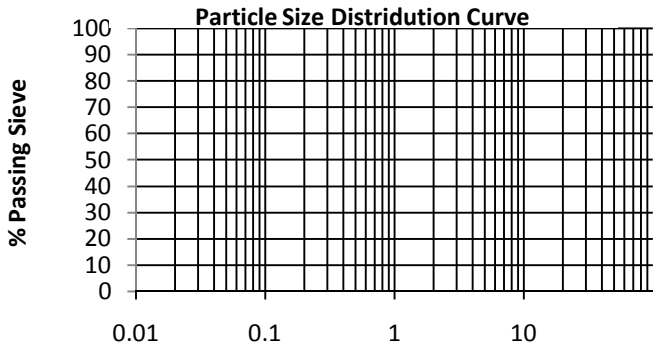
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 2		**Soil Description.**	Boulder			
Bore Hole	BH # 2	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	4.50 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

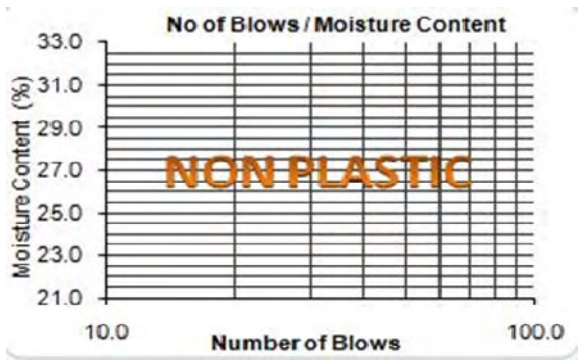
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	10.00
MDD g/cc	1.880
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD%	7.7
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

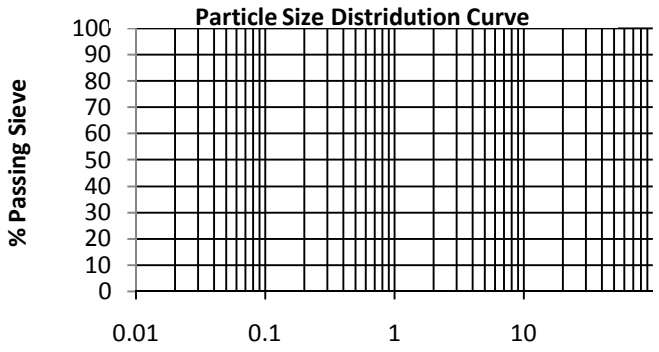
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Bore Hole No # 2	**Soil Description.**	Boulder		
Bore Hole	BH # 2 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	6.00 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

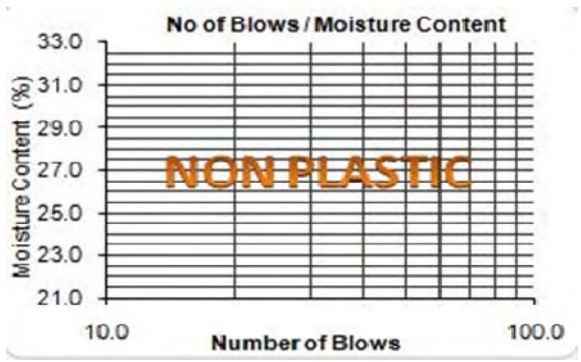
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

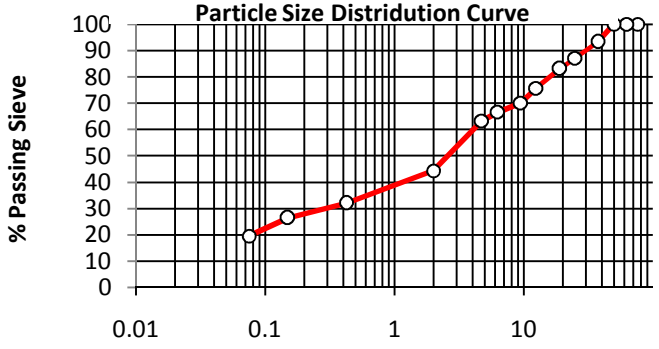
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Description.**	Silty Sand with gravel			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	0.75 m	**QTY. Represented,**	1 Bag Aprox (50 KG)				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	2474.0
B	Wt. of Dry Sample After Washing	g	1892.1
C	Wt. of Mat'ls Loss During Washing (A - B)	g	581.9
D	%tage of Mat'ls Passing 75µm (no. 200)	g	23.5
E	Natural Moisture Content	%	3.6

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	0	0.0	100.0	100	
1 1/2	37.5	164	6.6	93.4	93	
1	25	318.2	12.9	87.1	87	
3/4	19	418.3	16.9	83.1	83	
1/2	12.5	599.5	24.2	75.8	76	
3/8	9.5	739.1	29.9	70.1	70	
1/4	6.3	825.2	33.4	66.6	67	
# 4	4.75	906.3	36.6	63.4	63	
# 10	2.00	1376.2	55.6	44.4	44	
# 40	0.425	1680.7	67.9	32.1	32	
# 100	0.150	1818.9	73.5	26.5	26	
# 200	0.075	1991.2	80.5	19.5	20	



Summary of S,Analysis

Gravel	37.0 %
Sand	43.0 %
%200 Sieve	20.0 %
N.Moisture	3.6

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

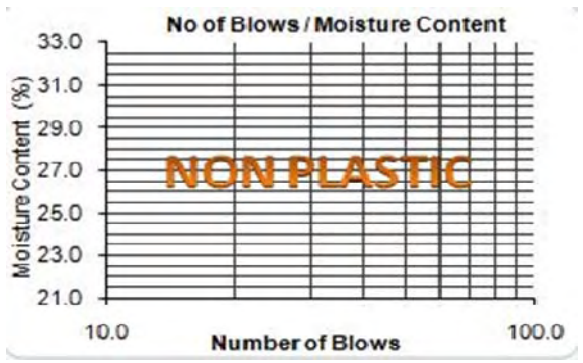
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

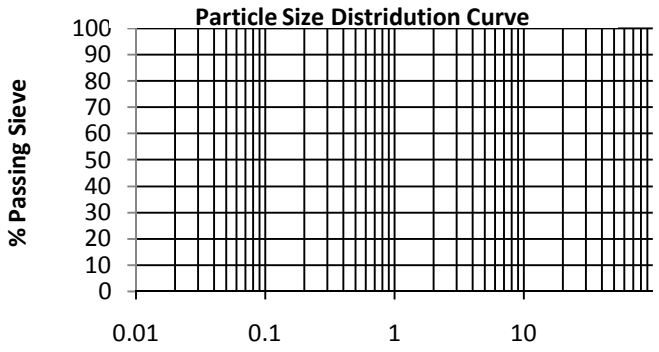
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Descoription.**	Boulder			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	1.50 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

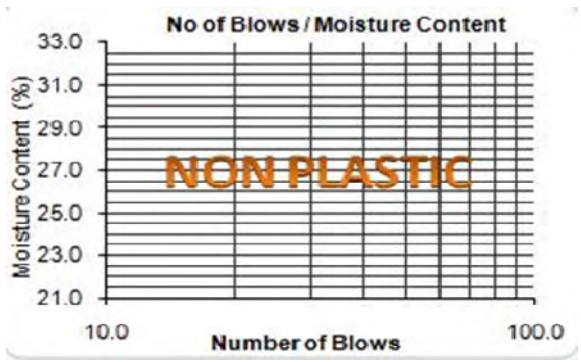
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

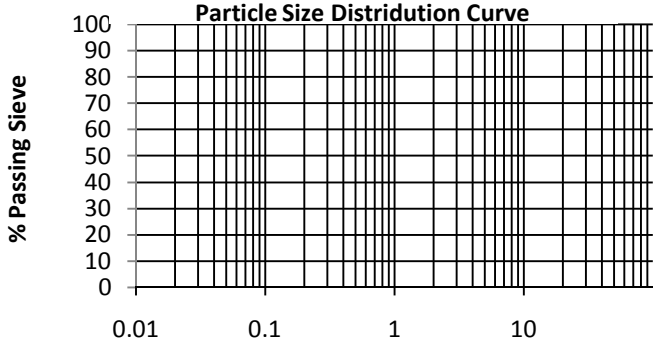
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Description.**	Boulder			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	2.25 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

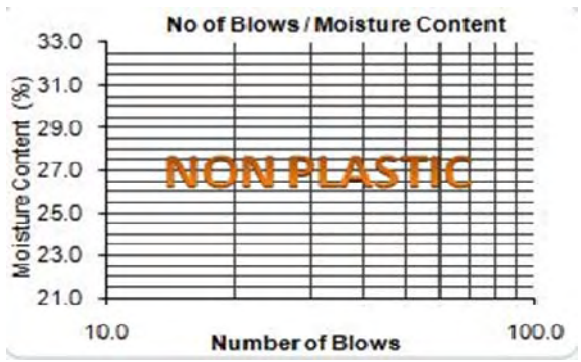
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

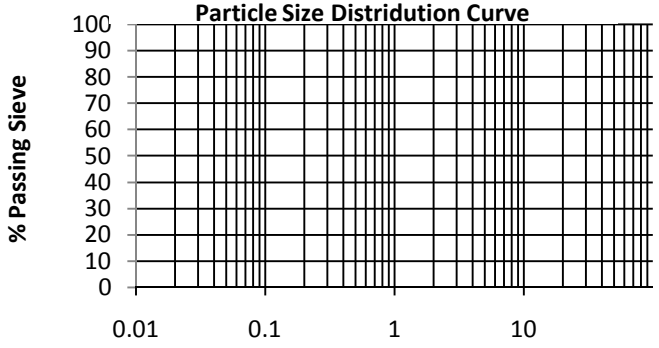
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Description.**	Boulder			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis	
Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS				
D 60				
D 30				
D 10				

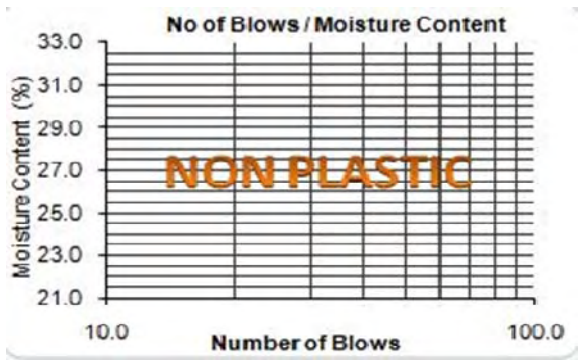
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		A-2	A-3	A-4	
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		A-5	A-5	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI	
LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

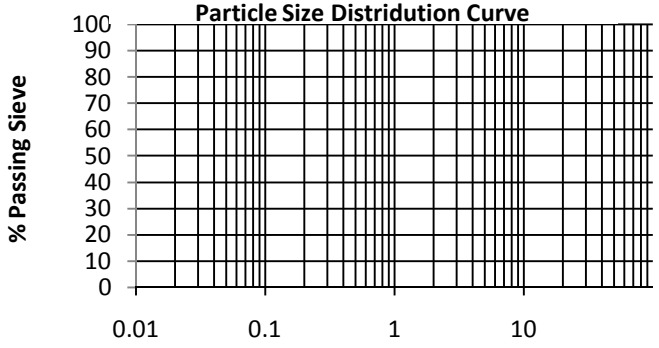
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Descoription.**	Boulder			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	4.50 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5		**Boulder**			
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

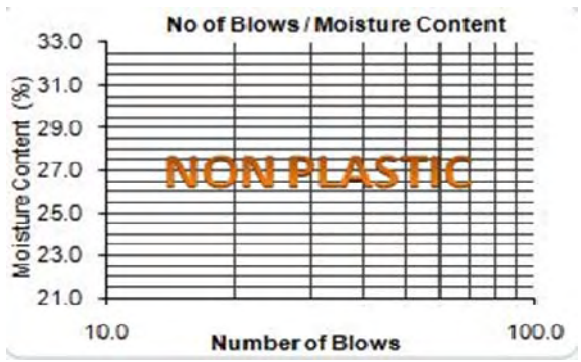
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		A-11	A-12	A-13	
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		A-14		Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	

MOISTURE-DENSITY (ASTM D1557)

OMC %	
MDD g/cc	

C B R (ASTM D1883)

CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

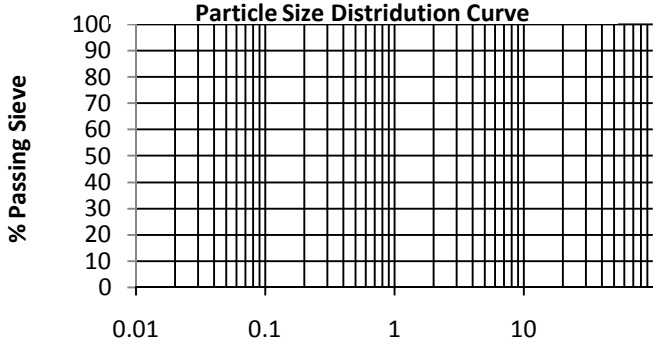
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 3		**Soil Descoription.**	Boulder			
Bore hole No.	BH # 3	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	6.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5		**Boulder**			
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

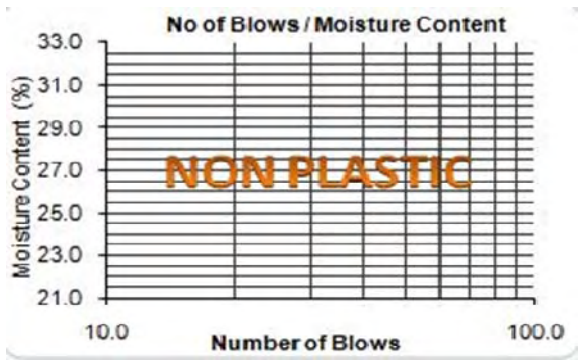
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		A-11	A-12	A-13	
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

A	Container No		A-14		Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	
Plastic Limit	
Plasticity Index	
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

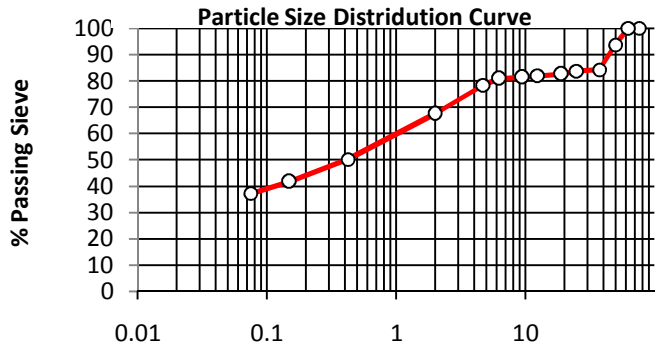
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Bore Hole No # 6	**Soil Descoription.**	Silty Sand with gravel		
Bore Hole No.	BH # 6 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	0.75 m **QTY. Represented,**	1 Bag Aprox (50 KG)			

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	3220.0
B	Wt. of Dry Sample After Washing	g	2035.0
C	Wt. of Mat'ls Loss During Washing (A - B)	g	1185.0
D	%tage of Mat'ls Passing 75µm (no. 200)	g	36.8
E	Natural Moisture Content	%	3.2

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2	0	0	100.0	100	
2 1/2	63	0	0	100.0	100	
2	50	201	6.2	93.8	94	
1 1/2	37.5	508	15.8	84.2	84	
1	25	524.1	16.3	83.7	84	
3/4	19	558.3	17.3	82.7	83	
1/2	12.5	580.6	18.0	82.0	82	
3/8	9.5	597.8	18.6	81.4	81	
1/4	6.3	615.4	19.1	80.9	81	
# 4	4.75	696.4	21.6	78.4	78	
# 10	2.00	1043.1	32.4	67.6	68	
# 40	0.425	1604.3	49.8	50.2	50	
# 100	0.150	1874.6	58.2	41.8	42	
# 200	0.075	2021.3	62.8	37.2	37	



Summary of S,Analysis

Gravel	22.0 %
Sand	41.0 %
%200 Sieve	37.0 %
N.Moisture	3.2

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

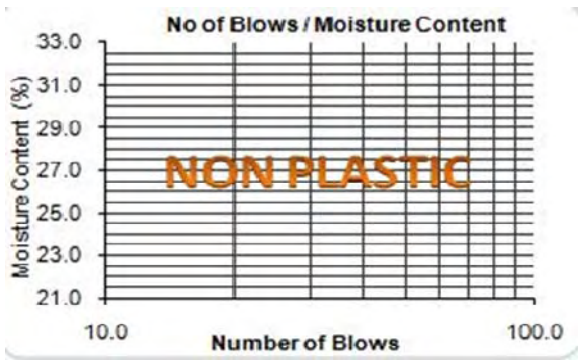
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			A-3	A-4	A-5	
A	Container No		A-3	A-4	A-5	
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			A-3		Average
A	Container No		A-3		Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	(SM)	Silty Sand with gravel



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

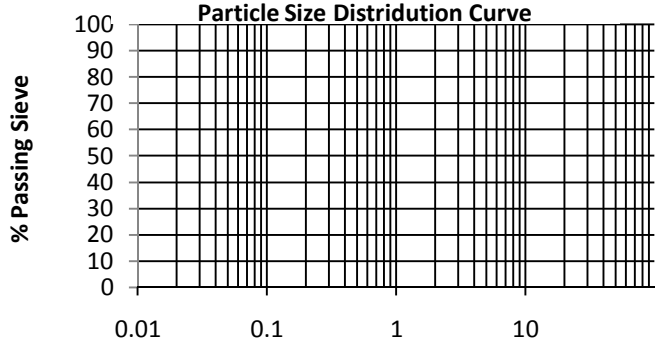
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Bore Hole No # 6	**Soil Descoription.**	Boulder		
Bore Hole No.	BH # 6 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	1.50 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

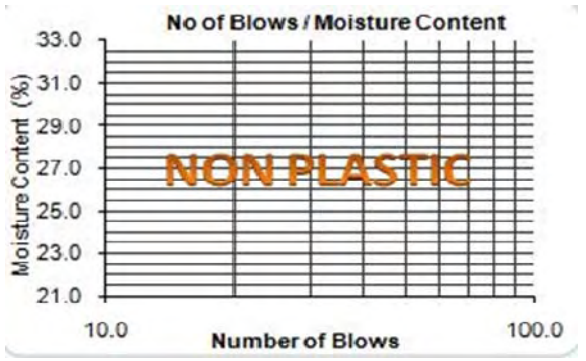
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			S-1	S-2	S-3	
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			S-6		Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

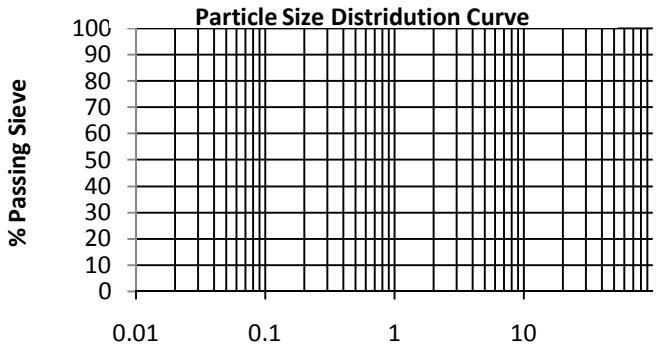
Client.	USAID	**Contractor.**	TETRA TECH	**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan	**Project No.**	KSC-229	**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation	**Submitted to.**	TETRA TECH		
Material Source.	Bore Hole No # 6	**Soil Description.**	Boulder		
Bore Hole No.	BH # 6 **Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,	
Depth of (M)	2.25 m **QTY. Represented,**				

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

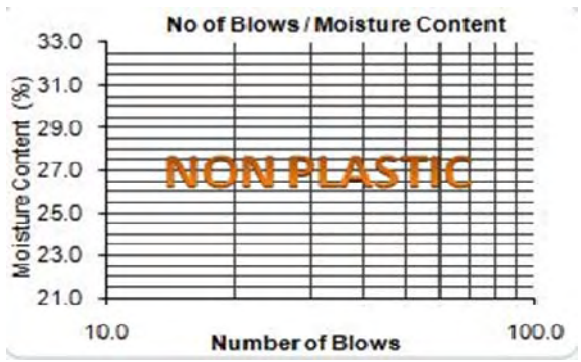
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			B-3	B-4	B-5	
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			B-3		Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	NP
Plastic Limit	NP
Plasticity Index	NP
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

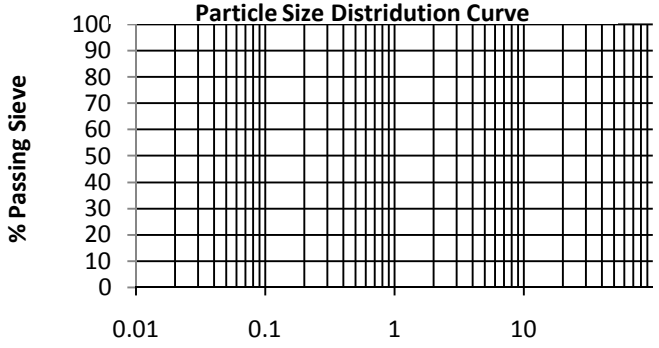
Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 6		**Soil Descoription.**	Boulder			
Bore Hole No.	BH # 6	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	3.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19		**Boulder**			
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

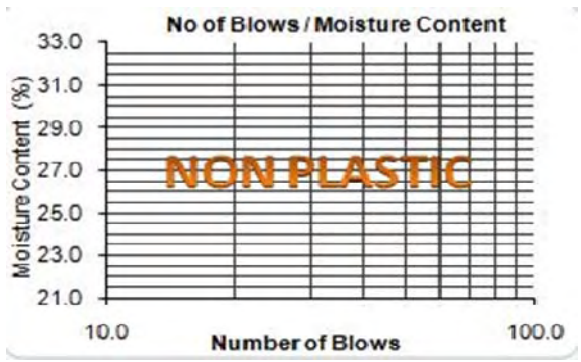
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

			D-1	D-2	D-3	
A	Container No					
B	Number of Bumps					
C	Mass of Wet Soil and Container	g				
D	Mass of Dry Soil & Container	g				
E	Mass of Container	g				
F	Mass of Moisture (C - D)	g				
G	Mass of Dry soil (D - E)	g				
H	Moisture Content (F / G) x 100	%				

PLASTIC LIMIT

			D-4		Average
A	Container No				
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

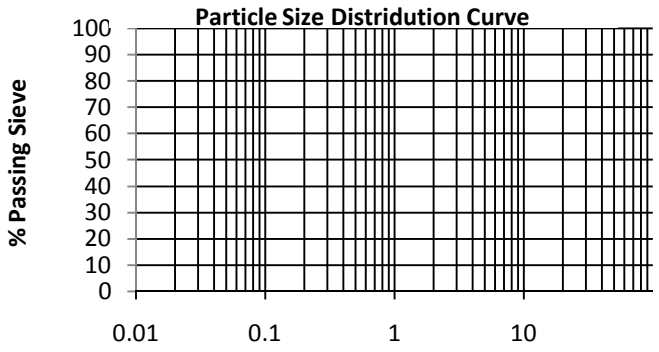
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 6		**Soil Description.**	Boulder			
Bore Hole No.	BH # 6	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	4.50 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

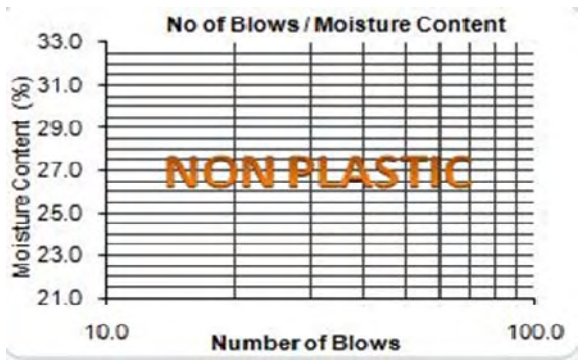
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		M-4	M-5	M-6		
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		M-7		Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**

MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	

C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal GEMTL
Shawal Geotechnical Engineering /Materials Testing Laboratory

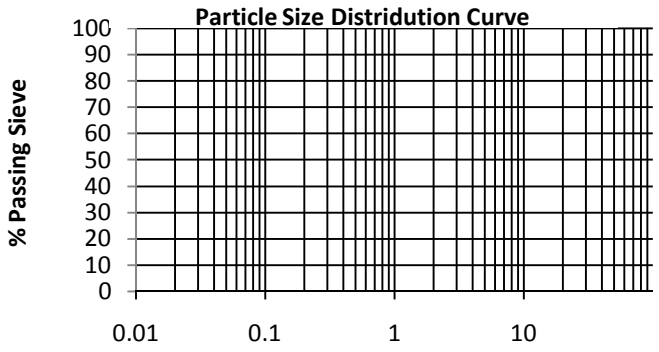
Client.	USAID		**Contractor.**	TETRA TECH		**Job No.**	GO -21
Project.	Geotechnical Explorationn for Salang Tunnel Substation, Afghanistan		**Project No.**	KSC-229		**Sample Date.**	11/11/2013
Project Location.	Parvan Province, Salang Tunnel Substation		**Submitted to.**	TETRA TECH			
Material Source.	Bore Hole No # 6		**Soil Description.**	Boulder			
Bore Hole No.	BH # 6	**Witnessed by.**	Contractor Rep.	**Sampled by.**	Shawal Lab by Field Team,		
Depth of (M)	6.00 m	**QTY. Represented,**					

SIEVE ANALYSIS OF GRANULAR SOILS (ASTM D 422)

A	Wt. of Dry Sample Before Washing	g	
B	Wt. of Dry Sample After Washing	g	
C	Wt. of Mat'ls Loss During Washing (A - B)	g	
D	%tage of Mat'ls Passing 75µm (no. 200)	g	
E	Natural Moisture Content	%	

Sieve Size		Weigth		% of	Whole NO.	SPECIFICATION
Inch	mm	Ret CUM(g)	% fo retained	Passing	% Passing	
3	76.2					
2 1/2	63					
2	50					
1 1/2	37.5					
1	25					
3/4	19					
1/2	12.5					
3/8	9.5					
1/4	6.3					
# 4	4.75					
# 10	2.00					
# 40	0.425					
# 100	0.150					
# 200	0.075					

Boulder



Summary of S,Analysis

Gravel	
Sand	
%200 Sieve	
N.Moisture	

THE PARTICALE SIZE DIAMETERS

D 60				
D 30				
D 10				

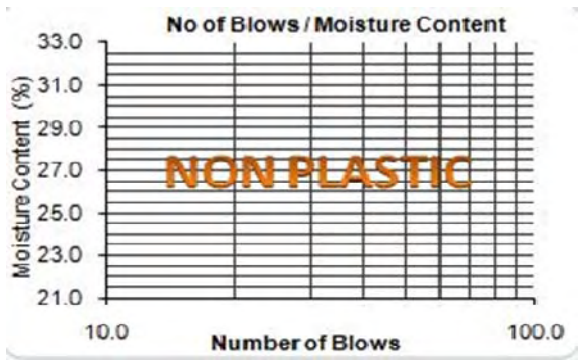
TEST REPORT LIQUID LIMIT AND PLASTIC LIMIT OF SOIL (ASTM D 4318)

A	Container No		4 D	2 D	3 D	4 D	
B	Number of Bumps						
C	Mass of Wet Soil and Container	g					
D	Mass of Dry Soil & Container	g					
E	Mass of Container	g					
F	Mass of Moisture (C - D)	g					
G	Mass of Dry soil (D - E)	g					
H	Moisture Content (F / G) x 100	%					

PLASTIC LIMIT

A	Container No		4 D	4 D	Average
C	Mass of Wet Soil and Container	g			
D	Mass of Dry Soil & Container	g			
E	Mass of Container	g			
F	Mass of Moisture (C - D)	g			
G	Mass of Dry soil (D - E)	g			
H	Moisture Content (F / G) x 100	%			

CLASSIFICATION OF SOIL ASTM D 2487	Boulder	Boulder



Summary of LL,PL,PI

LL @ 25 Blows	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
MOISTURE-DENSITY (ASTM D1557)	
OMC %	
MDD g/cc	
C B R (ASTM D1883)	
CBR Det. @ 95 of MDD	
% EXPANSION / CONSOLIDATION	

Lab.Manager

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	10/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
BH #	3	Depth(m)	0.75	Tested By	Hikmat

Horizontal Gage Shear Displacement	Sample No. 1				Sample No. 2				Sample No. 3			
	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress	Vertical Deformation	Proving Ring Read	Shear Force	Shear Stress
(0.01 mm)	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2	mm		(Kg)	Kg/cm2
0.0	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000	0.00	0.00	0.00	0.000000
25.0	0.03	2.00	1.60	0.015822	0.06	6.10	4.87	0.048256	0.12	6.10	4.87	0.048256
50.0	0.05	3.30	2.64	0.026106	0.11	8.50	6.79	0.067243	0.15	11.00	8.79	0.087020
75.0	0.07	4.60	3.68	0.036390	0.14	10.60	8.47	0.083855	0.20	15.90	12.70	0.125783
100.0	0.10	7.90	6.31	0.062496	0.16	14.30	11.43	0.113126	0.23	21.10	16.86	0.166920
125.0	0.13	10.70	8.55	0.084647	0.18	18.40	14.70	0.145560	0.25	27.20	21.73	0.215176
150.0	0.15	12.70	10.15	0.100468	0.20	22.70	18.14	0.179577	0.30	32.40	25.89	0.256313
175.0	0.17	16.10	12.86	0.127365	0.22	24.20	19.34	0.191444	0.32	36.30	29.00	0.287165
200.0	0.22	18.10	14.46	0.143187	0.23	28.30	22.61	0.223878	0.36	42.10	33.64	0.333049
250.0	0.24	18.80	15.02	0.148725	0.26	30.20	24.13	0.238909	0.39	50.20	40.11	0.397127
300.0	0.26	19.60	15.66	0.155053	0.30	34.20	27.33	0.270552	0.41	55.30	44.18	0.437472
400.0	0.28	21.00	16.78	0.166129	0.33	38.20	30.52	0.302196	0.44	57.10	45.62	0.451712
500.0	0.28	21.00	16.78	0.166129	0.35	40.10	32.04	0.317227	0.46	60.10	48.02	0.475445
600.0	0.25	19.80	15.82	0.156636	0.35	40.10	32.04	0.317227	0.49	62.10	49.62	0.491266
700.0	0.27	19.50	15.58	0.154262	0.37	39.60	31.64	0.313271	0.49	62.10	49.62	0.491266
800.0	0.27	19.30	15.42	0.152680	0.37	39.10	31.24	0.309316	0.48	61.50	49.14	0.486520
900.0	0.26	18.80	15.02	0.148725	0.36	38.40	30.68	0.303778	0.48	60.90	48.66	0.481773
1000.0	0.25	18.00	14.38	0.142396	0.36	38.10	30.44	0.301405	0.47	60.30	48.18	0.477027

Description of Soil (Class)	*SM*			*Strain Rate*	*0.5 mm/min*
Sample No.	*1*	*2*	*3*	*Type of Test*	*CD*
Normal Stress, kg/cm²	*0.244500*	*0.486900*	*0.734600*	*Proving Ring Calibration Factor*	*0.52 kg/Div*

Shawal Geotechnical Engineering and Materials Testing Laboratory

Company	TETRA TECH			Sampling Date	10/11/2013
Project	Geotechnical Explorationn for Salang Tunnel Substation, Parwan Province, Afghanistan			Testing Date	19/11/2013
BH #	3	Depth(m)	0.75	Description of Soil	SM

DIRECT SHEAR TEST (ASTM D3080)

Type of Test	CD		
Strain Rate	0.5 mm/min		
Sample No.	1	2	3
Normal Stress, kg/cm^2	0.244500	0.486900	0.734600

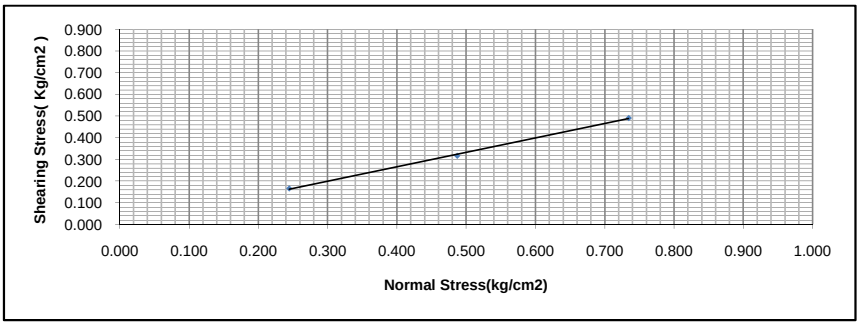
SOIL SPECIMEN MEASUREMENTS

Diameter	(cm)	9.99	9.99	9.99
Height	(cm)	2	2	2
Area	(cm^2)	99.8	99.8	99.8
Volume	(cm^3)	199.6	199.6	199.6
Weight of Soil + Split Former	(g)	464.2	464.0	463.3
Weight of Split Former	(g)	119	119	119
Weight of Soil	(g)	345.23	345.03	344.33
Wet Unit Weight	(kg/cm3)	1.73	1.73	1.73
Dry Unit Weight	(kg/cm3)	1.67	1.68	1.67

WATER CONTENT DETERMINATION

Container No.		1	2	3.00
Weight of Wet Soil + Container	(g)	121.4	134.8	138.3
Weight of Dry Soil + Container	(g)	118.3	131.8	135.2
Weight of Water	(g)	3.042	3.05	3.10
Weight of Container	(g)	32.198	35.71	33.13
Weight of Dry Soil	(g)	86.14	96.058	102.11
Water Content	(%)	3.53	3.18	3.04

Sample No.	Water Content %		Normal Stress kg/cm^2	Max. Shearing Stress kg/cm2
	before test	after test		
1	3.53	3.30	0.244500	0.166129
2	3.18	2.82	0.486900	0.317227
3	3.04	2.63	0.734600	0.491266



Cohesion, *C* =	0.000	Kg/cm2

Angle =	30.0	Degree

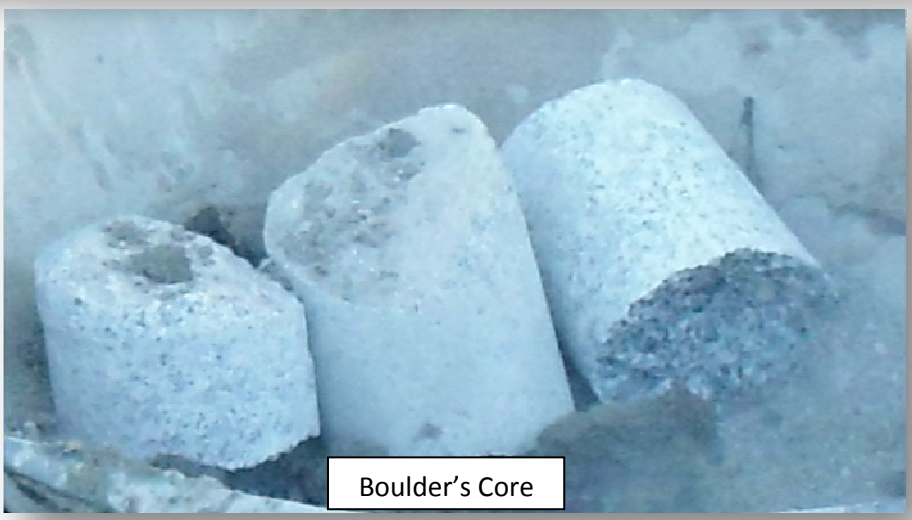
Appendix G

Field working and Laboratory analysis Photos

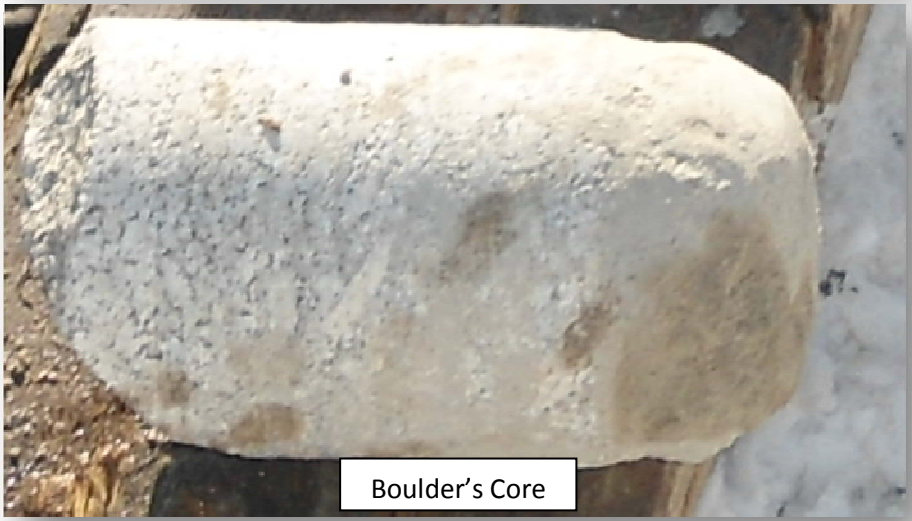
1- *General view of the project site*

2- *Boreholes boring photos*

1- *Test Pit Excavation Photos*



Boulder's Core



Boulder's Core

2- *Lab Testing Photos*

Appendix H

Laboratory Certificate by (USACE-AED)

DEPARTMENT OF THE ARMY

AFGHANISTAN ENGINEER DISTRICT
U.S. ARMY CORPS OF ENGINEERS
KABUL, AFGHANISTAN
APO, AE 09356

REPLY TO
ATTENTION OF:

CE-TAN 12 Nov 2012

LABORATORY INSPECTION AND CERTIFICATION FOR

Shawal Geotechnical Materials Lab

This letter confirms the completion of inspection and certification for the **Shawal Geotechnical Materials Lab** at the following locations in Afghanistan: Kabul. While **Shawal Geotechnical Materials Lab** has one physical lab location in Kabul, they can perform field tests anywhere in Trans Atlantic District – North (TAN). They will also be recommended for use anywhere in Trans Atlantic District – South (TAS).

This laboratory should now be considered as certified for use by the Trans Atlantic District – North (TAN), U.S. Army Corps of Engineers (USACE), for the quality control tests listed in Tables 1 through 7. This certification will be included with records that are maintained at the AEN Headquarters in Kabul, Afghanistan. Retaining certification will require yearly inspections by the AED. This certification is valid through 11 NOV 2013. This certification is also contingent upon the continued employment of Mr. Mohammad Ashraf, President/Senior Laboratory manager, Mr. Ahmad Shahpoor, Senior Laboratory Engineer and Mr. Zafar Ahmad, Geologist. Without the oversight of these gentlemen, the laboratory will require recertification. Finally, if the laboratory is moved to a new location, it will require recertification.

The inspection and certification process for the **Shawal Geotechnical Materials Lab** adhered to procedures outlined by the Materials Testing Center (MTC), which is located at the Geotechnical and Structures Laboratory (GSL), U.S. Army Engineer Research and Development Center (ERDC) in Vicksburg, Mississippi, USA. The MTC is the USACE-authorized agency for certifying laboratories for use in quality control testing for USACE construction projects. To facilitate construction in Afghanistan, the AEN has authorized the Chief of the Quality Assurance Branch to conduct laboratory certifications with strict adherence to MTC protocol.

[redacted]

Assistant Chief, Construction Branch
Trans Atlantic District – North
U.S. Army Corps of Engineers

Certified Material Test Procedures Include:
Soils (27 test procedures)
Aggregate (24 test procedures)
Cement, Grout, Mortar, and Concrete (38 test procedures)
Asphalt (39 test procedures)
Bricks, Stone, and CMU (10 test procedure)
Advance Soil Tests (13 test procedures)
Steel Testing (4 test procedures)
Water well tests and report
Calibration Services
Materials Testing Training Program

Attachment (7 pages)

Shawal Geotechnical Materials Testing Lab

Certified Laboratory Tests

Table 1. Soils

Test Method	Test Procedure Title
ASTM D 421	Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants
ASTM D 422	Particle-Size Analysis of Soils
ASTM D 427	Shrinkage Factors of Soils by the Mercury Method
ASTM D 558	Moisture-Density Relations of Soil-Cement Mixtures
ASTM D 698	Laboratory Compaction Characteristics of Soil Using Standard Effort
ASTM D 854	Specific Gravity of Soil Solids by Water Pycnometer
ASTM D 1140	Amount of Material in Soils Finer than the No. 200 (75-um) Sieve
ASTM D 1556	Density and Unit Weight of Soil in Place by the Sand Cone Method
ASTM D 1557	Laboratory Compaction Characteristics of Soil Using Modified Effort
ASTM D 1883	CBR (California Bearing Ratio) of Laboratory-Compacted Soils
ASTM D 2166	Unconfined Compressive Strength of Cohesive Soil
ASTM D 2216	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D 2487	Classification of Soils for Engineering Purposes
ASTM D 2488	Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM D 3740	Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D 4318	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D 4643	Determination of Water (Moisture) Content of Soil by the Microwave Oven Heating
ASTM D 4718	Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
ASTM D 6951	Use of the Dynamic Cone Penetrometer in Shallow Pavement Applications
AASHTO T 92	Determining the Shrinkage Factors of Soils
AASHTO T 93	Determining the Field Moisture Equivalent of Soils
AASHTO T 224	Correction for Coarse Particles in the Soil Compaction Test
CRD-C 654	Standard Test Method for Determining the California Bearing Ratio of Soils (Field Test)
BS 1377-2	Determination of Liquid Limit by Cone Penetration Method

Table 2. Aggregates

Test Method	Test Procedure Title
ASTM C 29	Unit Weight and Voids in Aggregate
ASTM C 40	Organic Impurities in Fine Aggregates for Concrete
ASTM C 70	Surface Moisture in Fine Aggregate
ASTM C 88	Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	Material Finer than 75 um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	Specific Gravity and Absorption of Coarse Aggregate
ASTM C 128	Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	Sieve Analysis of Fine and Coarse Aggregates
ASTM C 142	Clay Lumps and Friable Particles in Aggregates
ASTM C 289	Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C 295	Petrographic Examination of Aggregates for Concrete
ASTM C 535	Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 566	Total Moisture Content
ASTM C 702	Reducing Samples of Aggregate to Testing Size
ASTM C 1252	Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)
ASTM D 75	Sampling Aggregates
ASTM D 2419	Sand Equivalent of Soils and Fine Aggregate
ASTM D 4791	Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D 4944	Field Determination of Water (Moisture) Content of Soil by the Calcium Carbide Gas Pressure Tester
ASTM D 5821	Determining the Percentage of Fractured Particles in Coarse Aggregate
CRD-C 171	Standard Test Method for Determining Percentage of Crushed Particles in Aggregate
BS 812 Section 105.1	Testing Aggregates. Methods for Determination of Particle Shape. Flakiness Index.
BS 812 Section 105.2	Testing Aggregates. Methods for Determination of Particle Shape. Elongation Index for Coarse Aggregate.

Table 3. Cement, Grout, Mortar, and Concrete

Test Method	Test Procedure Title
ASTM C 31	Making and Curing Test Specimens in the Field
ASTM C 39	Compressive Strength of Cylindrical Specimens
ASTM C 42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C 109	Compressive Strength of Hydraulic Cement Mortars
ASTM C 114	Chemical Analysis of Hydraulic Cement
ASTM C 138	Unit Weight and Air Content by Gravimetric
ASTM C 143	Slump of Hydraulic-Cement Concrete
ASTM C 151	Autoclave Expansion of Hydraulic Cement
ASTM C 172	Sampling Freshly Mixed Concrete
ASTM C 174	Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
ASTM C 185	Air Content of Hydraulic Cement Mortar
ASTM C 187	Normal Consistency of Hydraulic Cement
ASTM C 188	Density of Hydraulic Cement
ASTM C 191	Time of Setting of Hydraulic Cement by Vicat Needle
ASTM C 192	Making and Curing Test Specimens in the Laboratory
ASTM C 204	Fineness of Hydraulic Cement by Air-Permeability Apparatus
ASTM C 231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 232	Bleeding of Concrete
ASTM C 359	Early Stiffening of Hydraulic Cement (Mortar Method)
ASTM C 430	Fineness of Hydraulic Cement by the 45-um (No. 325) Sieve
ASTM C 451	Early Stiffening of Hydraulic Cement (Paste Method)
ASTM C 470	Molds for Forming Concrete Test Cylinders Vertically
ASTM C 511	Moist Cabinets, Moist Rooms, Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
ASTM C 617	Capping Cylindrical Concrete Specimens
ASTM C 642	Density, Absorption, and Voids in Hardened Concrete
ASTM C 803	Penetration Resistance of Hardened Concrete
ASTM C 805	Rebound Number of Hardened Concrete
ASTM C 856	Petrographic Examination of Hardened Concrete
ASTM C 1019	Sampling and Testing Grout
ASTM C 1064	Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1074	Estimating Concrete Strength by the Maturity Method
ASTM C 1077	Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1084	Portland-Cement Content of Hardened Hydraulic-Cement Concrete
ASTM C 1437	Flow of Hydraulic Cement Mortar
ASTM C 1602	Mixing Water Used in the Production of Hydraulic Cement Concrete
AASHTO T 26	Quality of Water to be Used in Concrete
AASHTO T 132	Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars

Table 4. Asphalt Cement and Asphalt Concrete

Test Method	Test Procedure Title
ASTM D 5	Penetration of Bituminous Materials
ASTM D 36	Softening Point of Bitumen (Ring-and-Ball Apparatus)
ASTM D 70	Density of Semi-Solid Bituminous Materials (Pycnometer Method)
ASTM D 88	Saybolt Viscosity
ASTM D 92	Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester
ASTM D 95	Water in Petroleum Products and Bituminous Materials by Distillation
ASTM D 113	Ductility of Bituminous Materials
ASTM D 140	Sampling Bituminous Materials
ASTM D 242	Mineral Filler for Bituminous Paving Mixtures
ASTM D 402	Distillation of Cutback Asphaltic (Bituminous) Products
ASTM D 546	Sieve Analysis of Mineral Filler for Bituminous Paving Mixtures
ASTM D 979	Sampling Bituminous Paving Mixtures
ASTM D 1074	Compressive Strength of Bituminous Mixtures
ASTM D 1754	Effects of Heat and Air on Asphaltic Materials (Thin-Film Oven Test)
ASTM D 2041	Theoretical Maximum Specific Gravity and Density of Bituminous Pavement Mixtures
ASTM D 2042	Solubility of Asphalt Materials in Trichloroethylene
ASTM D 2170	Kinematic Viscosity of Asphalts (Bitumens)
ASTM D 2171	Viscosity of Asphalts by Vacuum Capillary Viscometer
ASTM D 2172	Quantitative Extraction of Bitumen from Bituminous Paving Mixtures
ASTM D 2489	Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D 2726	Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D 2872	Effect of Heat and Air on a Moving Film of Asphalt (Rolling Thin-Film Oven Test)
ASTM D 3203	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D 3549	Thickness or Height of Compacted Bituminous Paving Mixture Specimens
ASTM D 3665	Random Sampling of Construction Materials
ASTM D 3666	Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D 5361	Sampling Compacted Bituminous Mixtures for Laboratory Testing
ASTM D 5444	Mechanical Size Analysis of Extracted Aggregate
ASTM D 6926	Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D 6927	Marshall Stability and Flow of Bituminous Mixtures
CRD-C 649	Standard Test Method for Unit Weight, Marshall Stability, and Flow of Bituminous Mixtures
CRD-C 650	Standard Method for Density and Percent Voids of Compacted Bituminous Paving Mixtures
CRD-C 652	Standard Test Method for Measurement of Reduction in Marshall Stability of Bituminous Mixtures Caused by Immersion in Water
AASHTO T 59	Standard Method of Test for Emulsified Asphalts
AASHTO T 79	Flash Point with Tag Open-Cup Apparatus for Use with Material Having a Flash Less Than 93.3ºC (200ºF)
AASHTO T 102	Spot Test of Asphaltic Materials
AASHTO T 182	Coating and Stripping of Bitumen-Aggregate Mixtures
AASHTO T 230	Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures

AASHTO T 283	Standard Method of Test for Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage

Table 5. Bricks, Stone, and Concrete Masonry Units

Test Method	**Test Procedure Title**
ASTM C 62	Building Brick (Solid Masonry Units Made From Clay or Shale)
ASTM C 67	Sampling and Testing Brick and Structural Clay Tile
ASTM C 90	Loadbearing Concrete Masonry Units
ASTM C 97	Absorption and Bulk Specific Gravity of Dimension Stone
ASTM C 99	Modulus of Rupture of Dimension Stone
ASTM C 140	Sampling and Testing Concrete Masonry Units and Related Units
ASTM C 170	Compressive Strength of Dimension Stone
ASTM C 880	Flexural Strength of Dimension Stone
ASTM C 1093	Accreditation of Testing Agencies for Unit Masonry
ASTM C 1552	Practice for Capping Concrete Masonry Units, Related Units, and Masonry Prisms for Compression Testing

Table 6. Advanced Soils Testing

Test Method	**Test Procedure Title**
ASTM D 1195	Repetitive Static Plate Load Tests of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements
ASTM D 1196	Nonrepetitive Static Plate Load Tests of Soils and Flexible Pavement Components, for Use in Evaluation and Design of Airport and Highway Pavements
ASTM D 1586	Penetration Test and Split-Barrel Sampling of Soils
ASTM D 2434	Permeability of Granular Soils (Constant Head)
ASTM D 2435	One-Dimensional Consolidation Properties of Soils Using Incremental Loading
ASTM D 2573	Field Vane Shear Test in Cohesive Soil
ASTM D 2850	Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils
ASTM D 3080	Direct Shear Test of Soils Under Consolidated Drained Conditions
ASTM D 3385	Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer
ASTM D 4767	Consolidated Undrained Triaxial Compression Test for Cohesive Soils
ASTM D 5084	Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM E 2396	Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Green Roof Systems
ASTM D 5333	Collapse Potential Test

Table 7. Steel

Test Method	**Test Procedure Title**
ASTM A 370	Test Methods and Definitions for Mechanical Testing of Steel Products
ASTM A 615	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM E 8	Tension Testing of Metallic Materials
AASHTO T 285	Bend Test for Bars for Concrete Reinforcement

Table 8. Water Well Testing and report

Water Quantity/ discharge test
Water Step Draw Down test
Recovery Test
Water well soil sampling and testing
Water well geological log preparation
Water Well Design
Complete Water Well Report

Table 9. Calibration Services

Calibration for all Lab Equipment
Calibration of Asphalt Plant
Calibration of Concrete Batching Plant
Calibration of Truck Scale/Weigh
Calibration &Installation of Plants,Scales

Table 10. Materials Testing Training Program

Available Courses Include:
Soil Sampling and Testing
Aggregate Sampling and Testing
Concrete Sampling and Testing
Cement Sampling and Testing
Bitumen Sampling and Testing
Hot Mix Asphalt (HMA) Sampling and Testing
Geotechnical Investigation Sampling and Testing
Steel Sampling and Testing

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
AFGHANISTAN ENGINEER DISTRICT - SOUTH
APO AE 09355

REPLY TO
ATTENTION OF

CETAS-EC-QAB

03 APRIL 2012

2012 INSPECTION AND CERTIFICATION FOR THE

SHAWAL GEOTECHNICAL ENGINEERING AND MATERIALS TESTING LABORATORY (GEMTL) AT KAF

This letter confirms the completion of 2012 inspection and certification for the Shawal GEMTL at KAF, Afghanistan. While this laboratory is located in KAF, the facility will be approved to conduct field tests anywhere in Afghanistan Engineer District (AED)–South. The laboratory will also be recommended for use anywhere in AED – North.

The inspection/evaluation is based on ASTM lab checklists and procedures including facility, equipment, calibration, knowledge, personnel, references, reporting and attitude. The inspection reflected the lab's positive and professional reputation.
This laboratory is certified for use by Afghanistan Engineer District South for the construction materials tests listed in lab inspection checklist (attached) conditional on compliance with ASTM and USACE standards. This certification will be included with records that are maintained at the AED Headquarters in KAF, Afghanistan. Retaining certification will require yearly inspections by AED-S. This certification is also contingent upon the continued employment of Deputy Manager Zafar Ahmad, Sr. Lab Technician and Ahmad Shah Poor, Lab Manager. Without the oversight of these gentlemen, the laboratory will require recertification. Also, if the laboratory moves to a new location, it will require recertification.

The inspection and certification process for the Shawal GEMTL Laboratory adhered to procedures outlined by the Materials Testing Center (MTC), located at the U.S. Army Engineer Research and Development Center (ERDC). Vicksburg, Mississippi, USA. The MTC is the USACE agency for certifying labs for quality control testing for USACE construction projects. To facilitate construction in Afghanistan, AED-S has authorized this author to conduct laboratory inspections and certifications with adherence to MTC standards.

[redacted]
Acting Chief of
Quality Assurance Branch
Afghanistan Engineer District – South
U.S. Army Corps of Engineers

[redacted]
Quality Assurance Branch
Afghanistan Engineer District - South
U.S. Army Corps of Engineers

CETAS-EC-QAB
SUBJECT: 2012 INSPECTION AND CERTIFICATION FOR THE SHAWAL GEMTL

Attachment (9 pages)

Certified Material Test Procedures Include (lab inspection checklist):
Aggregate (21 test procedures)
Bituminous (10 test procedure)
Concrete (9 test procedures)
Masonry (5 test procedures)
Soils (14 test procedures)

SHAWAL GEMTL – Equipment Calibration	Upon Request
SHAWAL GEMTL – Curriculum Vitae	Upon Request
SHAWAL GEMTL – Lab Photos	Upon Request